

108-1064SA000

FIG. 1A

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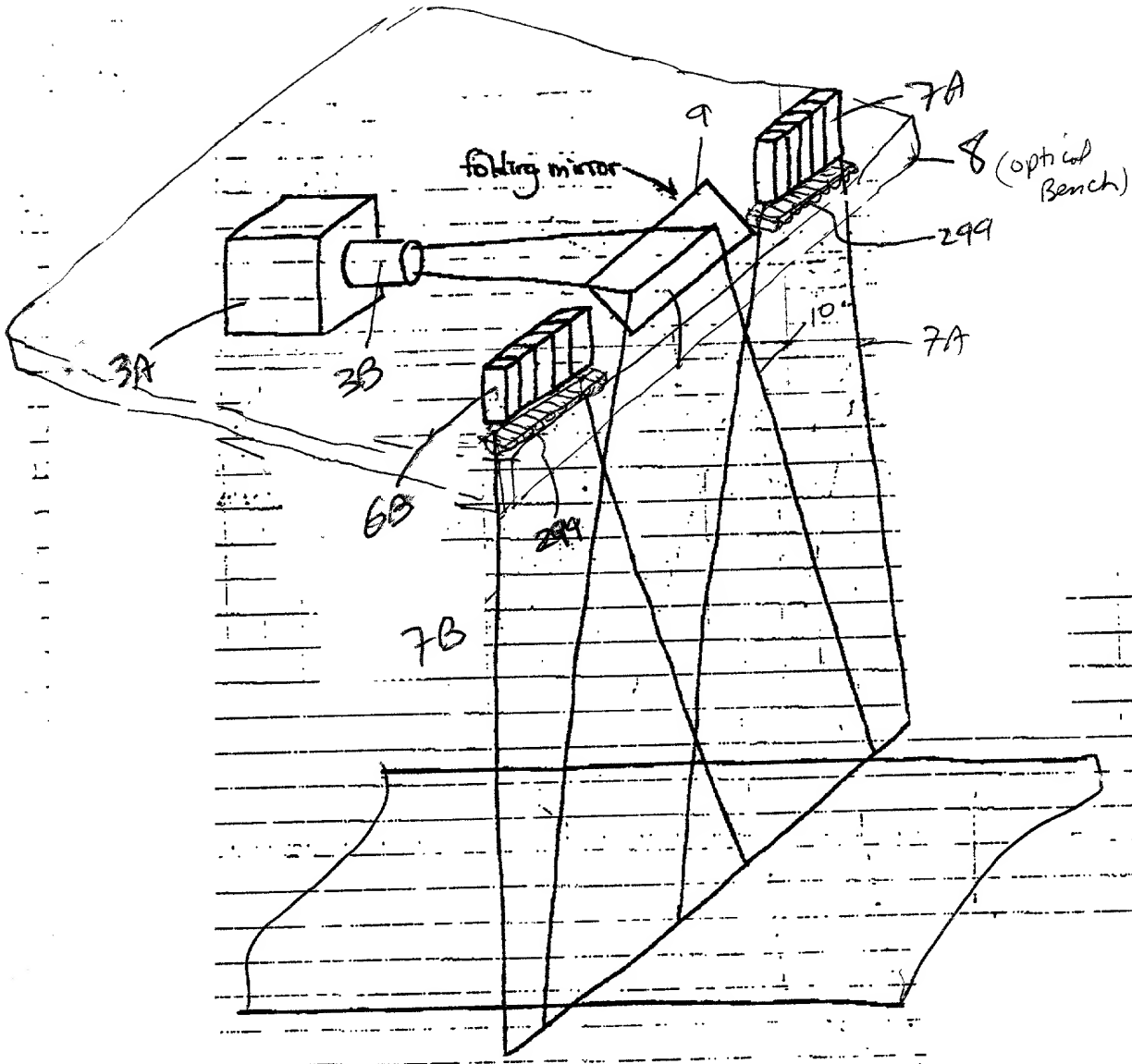


FIG. 1B1

↑
1A

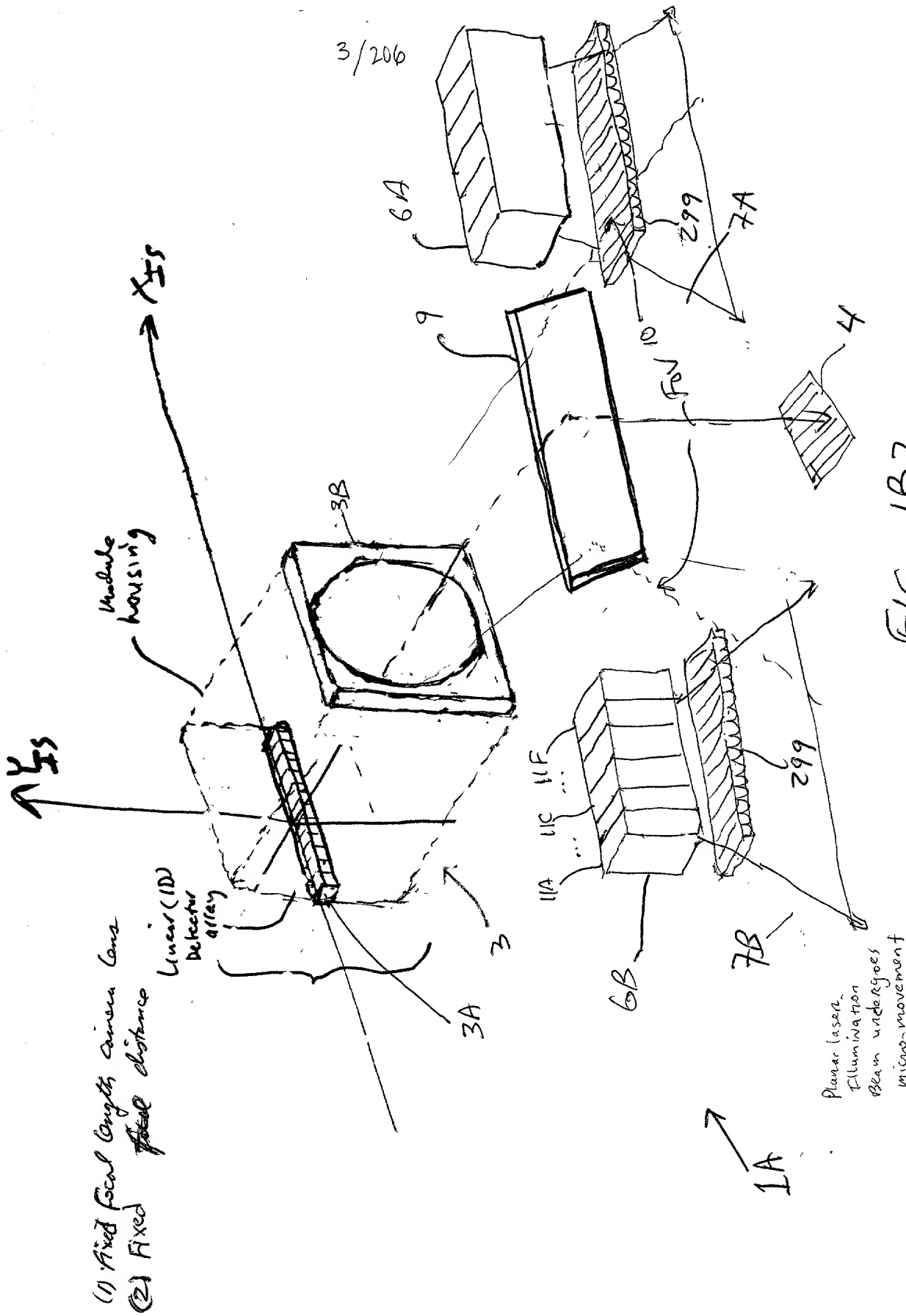


FIG. 1B2

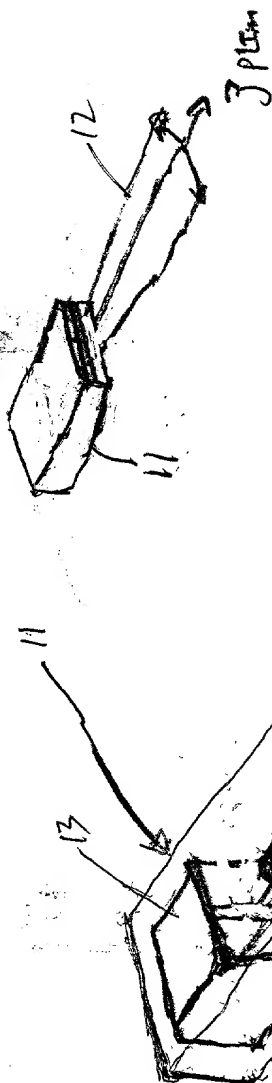


FIG. 1C

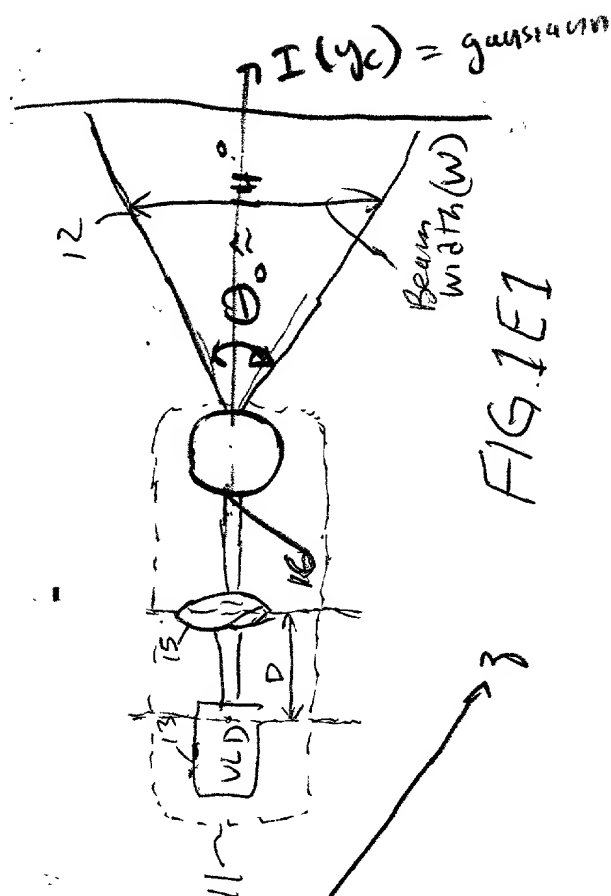


FIG. 1E1

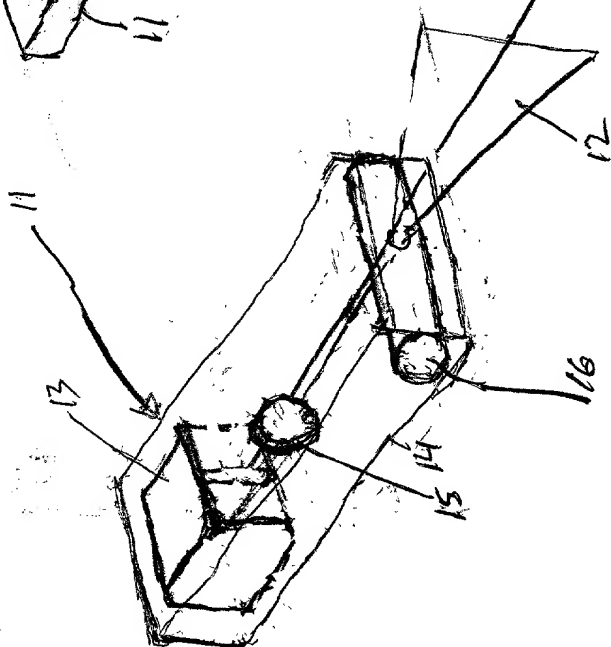


FIG. 1D

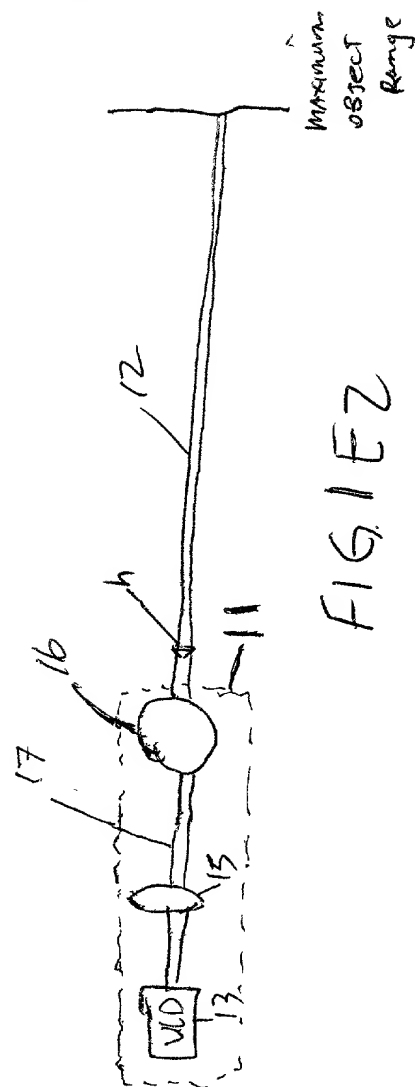


FIG. 1E2

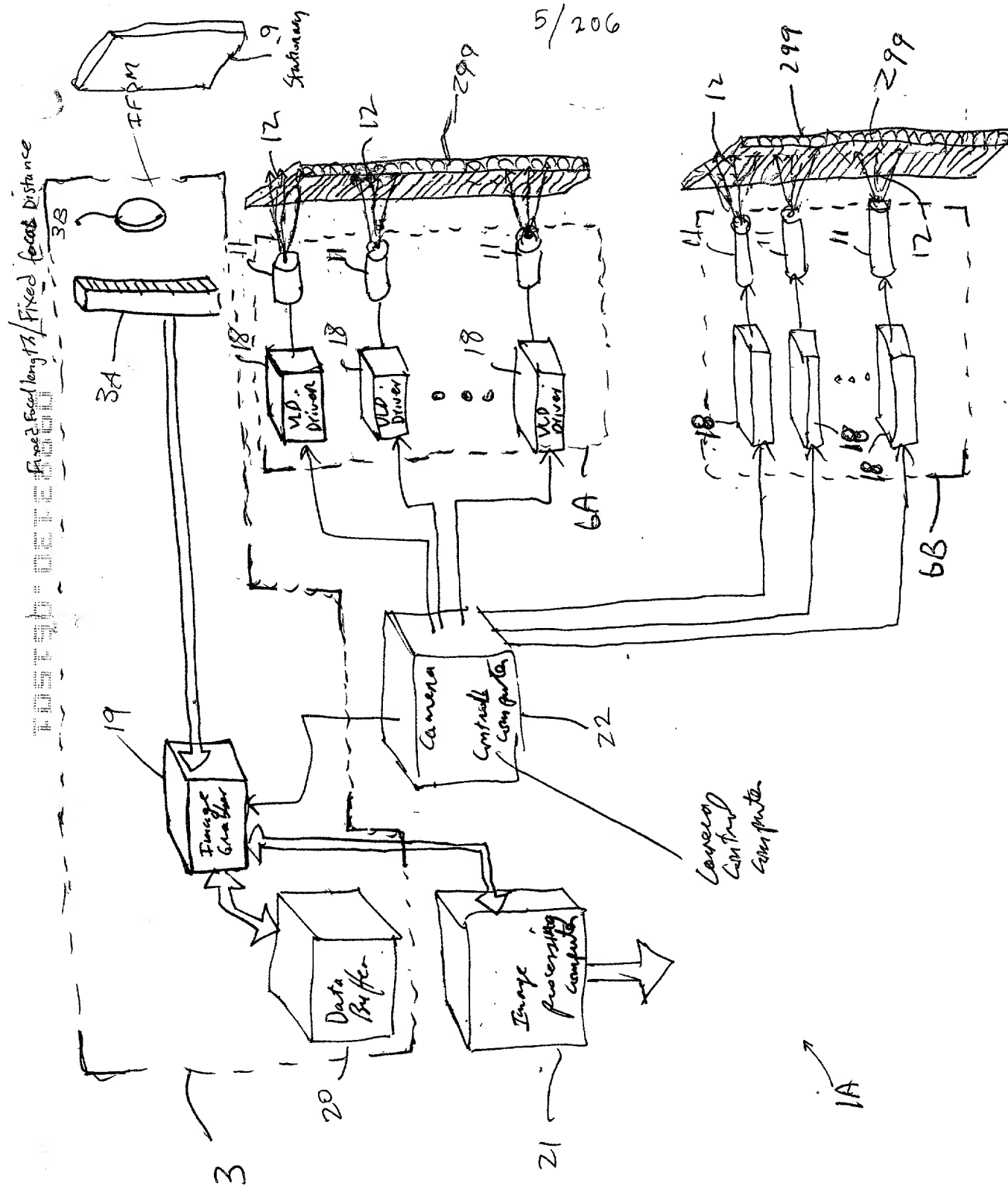


FIG. 1F

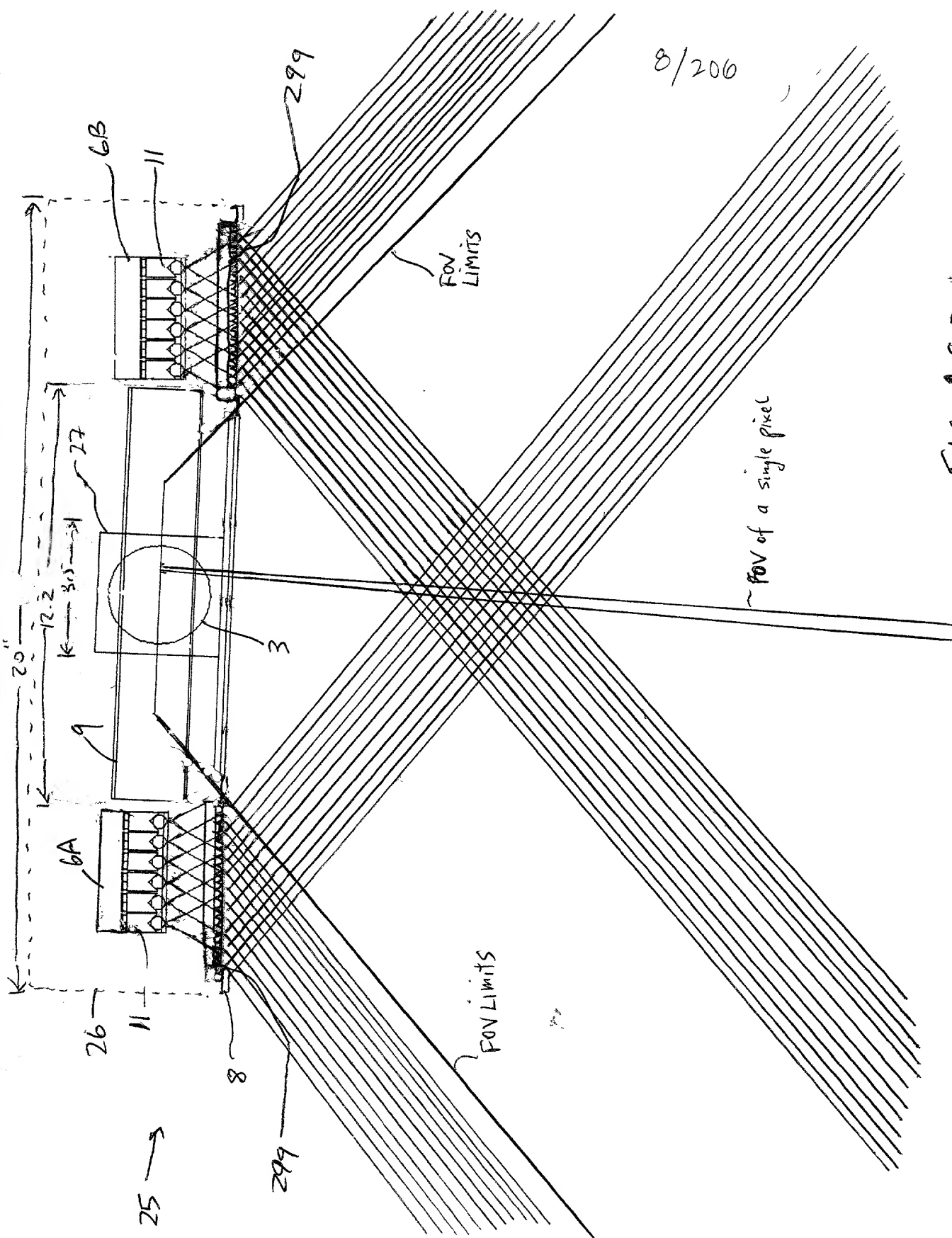
Variable	Mean	SD	Min	Max	Skewness	Kurtosis	Normality
Age	35.2	12.5	18	65	0.15	3.2	0.98
Gender	0.52	0.50	0	1	-0.05	3.0	0.99
Marital Status	0.68	0.47	0	1	0.10	3.1	0.98
Education	12.5	2.1	9	16	-0.20	3.3	0.97
Income	4500	1500	1000	10000	0.30	3.4	0.96
Occupation	1.2	0.8	0	2	-0.10	3.0	0.99
Health Status	0.75	0.42	0	1	0.05	3.1	0.98
Stress Level	3.2	1.5	1	5	0.20	3.5	0.95
Life Satisfaction	4.1	1.2	1	7	-0.15	3.2	0.97
Resilience	2.8	1.1	1	5	0.10	3.1	0.98
Optimism	3.5	1.3	1	6	-0.05	3.0	0.99
Emotional Stability	4.3	1.0	1	7	-0.10	3.2	0.97
Self-Esteem	3.8	1.4	1	6	0.05	3.1	0.98
Life Purpose	4.5	1.1	1	7	-0.15	3.2	0.97
Gratitude	4.2	1.2	1	7	-0.10	3.1	0.98
Forgiveness	4.0	1.3	1	7	-0.05	3.0	0.99
Empathy	4.1	1.1	1	7	-0.10	3.2	0.97
Compassion	4.3	1.0	1	7	-0.15	3.2	0.97
Kindness	4.4	1.1	1	7	-0.10	3.1	0.98
Generosity	4.2	1.2	1	7	-0.05	3.0	0.99
Patience	4.1	1.1	1	7	-0.10	3.2	0.97
Humility	4.0	1.2	1	7	-0.05	3.1	0.98
Modesty	3.9	1.3	1	7	0.00	3.0	0.99
Meekness	3.8	1.4	1	7	0.05	3.1	0.98
Lowliness	3.7	1.5	1	7	0.10	3.2	0.97
Softness	3.6	1.6	1	7	0.15	3.3	0.96
Gentleness	3.5	1.7	1	7	0.20	3.4	0.95
Mildness	3.4	1.8	1	7	0.25	3.5	0.94
Placability	3.3	1.9	1	7	0.30	3.6	0.93
Docility	3.2	2.0	1	7	0.35	3.7	0.92
Submissiveness	3.1	2.1	1	7	0.40	3.8	0.91
Humbleness	3.0	2.2	1	7	0.45	3.9	0.90
Modestly	2.9	2.3	1	7	0.50	4.0	0.89
Lowly	2.8	2.4	1	7	0.55	4.1	0.88
Meekly	2.7	2.5	1	7	0.60	4.2	0.87
Gently	2.6	2.6	1	7	0.65	4.3	0.86
Mildly	2.5	2.7	1	7	0.70	4.4	0.85
Placably	2.4	2.8	1	7	0.75	4.5	0.84
Docilely	2.3	2.9	1	7	0.80	4.6	0.83
Submissively	2.2	3.0	1	7	0.85	4.7	0.82
Humbleness	2.1	3.1	1	7	0.90	4.8	0.81
Modestly	2.0	3.2	1	7	0.95	4.9	0.80
Lowly	1.9	3.3	1	7	1.00	5.0	0.79
Meekly	1.8	3.4	1	7	1.05	5.1	0.78
Gently	1.7	3.5	1	7	1.10	5.2	0.77
Mildly	1.6	3.6	1	7	1.15	5.3	0.76
Placably	1.5	3.7	1	7	1.20	5.4	0.75
Docilely	1.4	3.8	1	7	1.25	5.5	0.74
Submissively	1.3	3.9	1	7	1.30	5.6	0.73
Humbleness	1.2	4.0	1	7	1.35	5.7	0.72
Modestly	1.1	4.1	1	7	1.40	5.8	0.71
Lowly	1.0	4.2	1	7	1.45	5.9	0.70
Meekly	0.9						



[illegible]

FIG. 142

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FIG. 1G3

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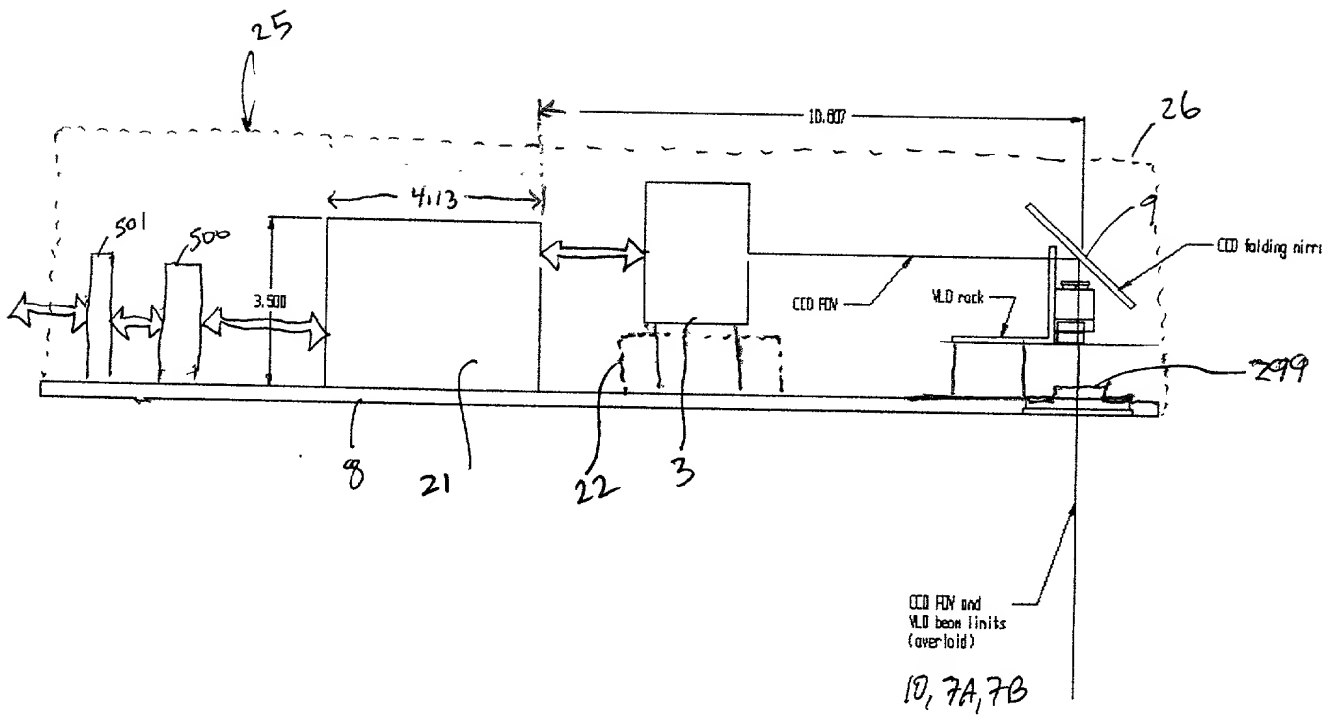
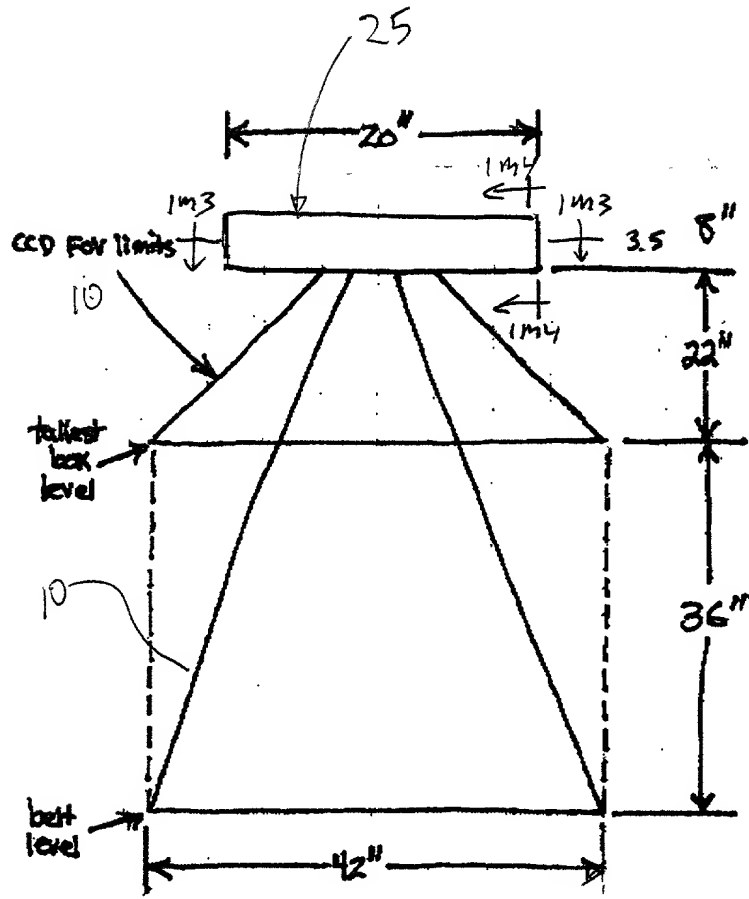


FIG. 164

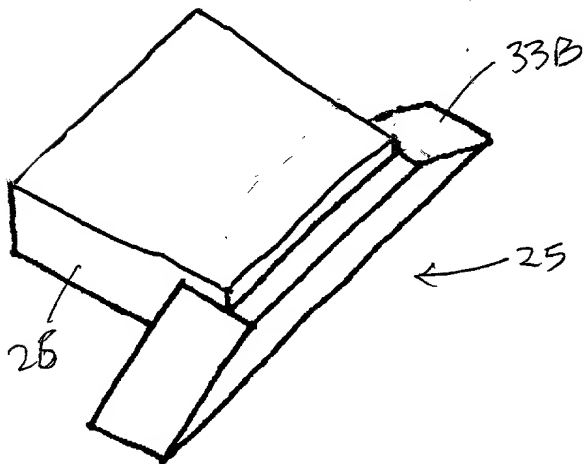
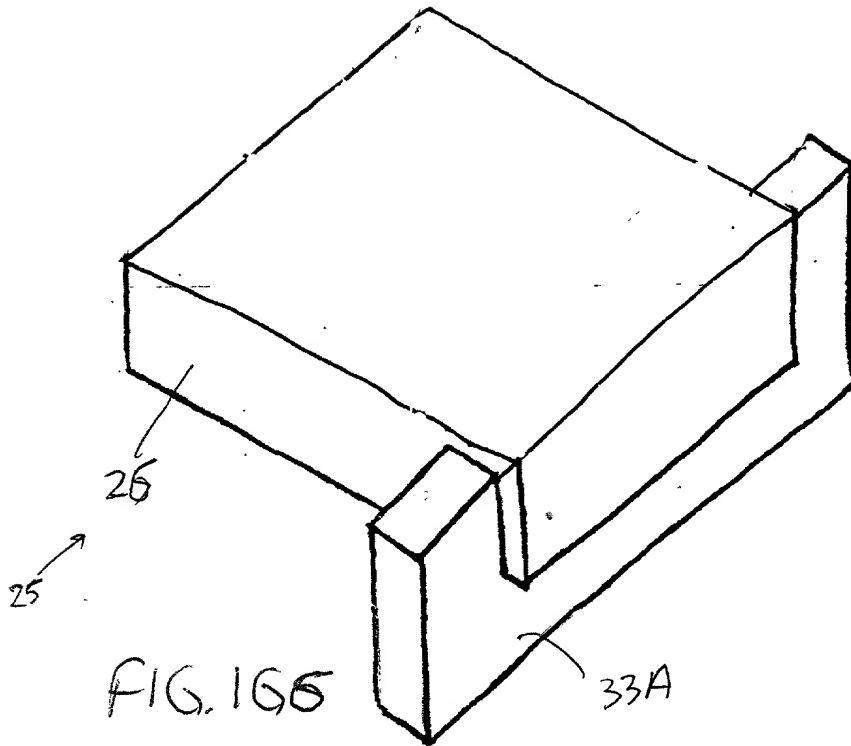
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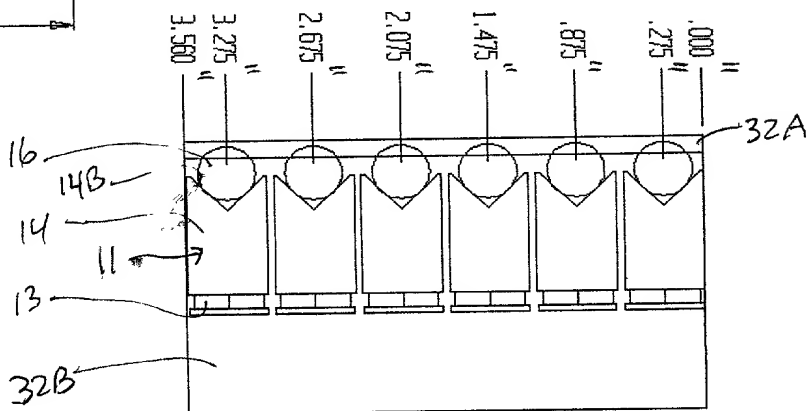
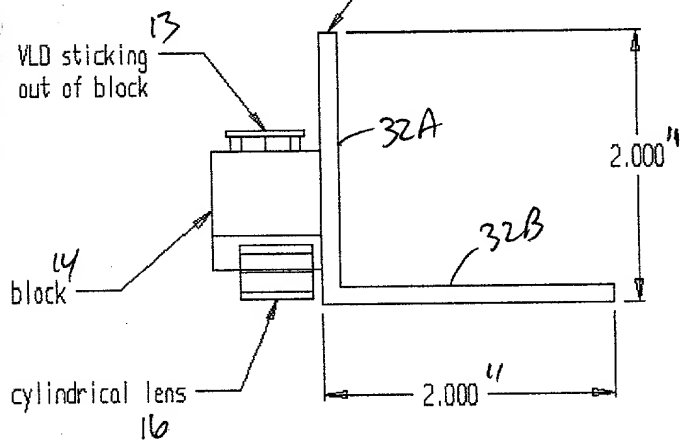
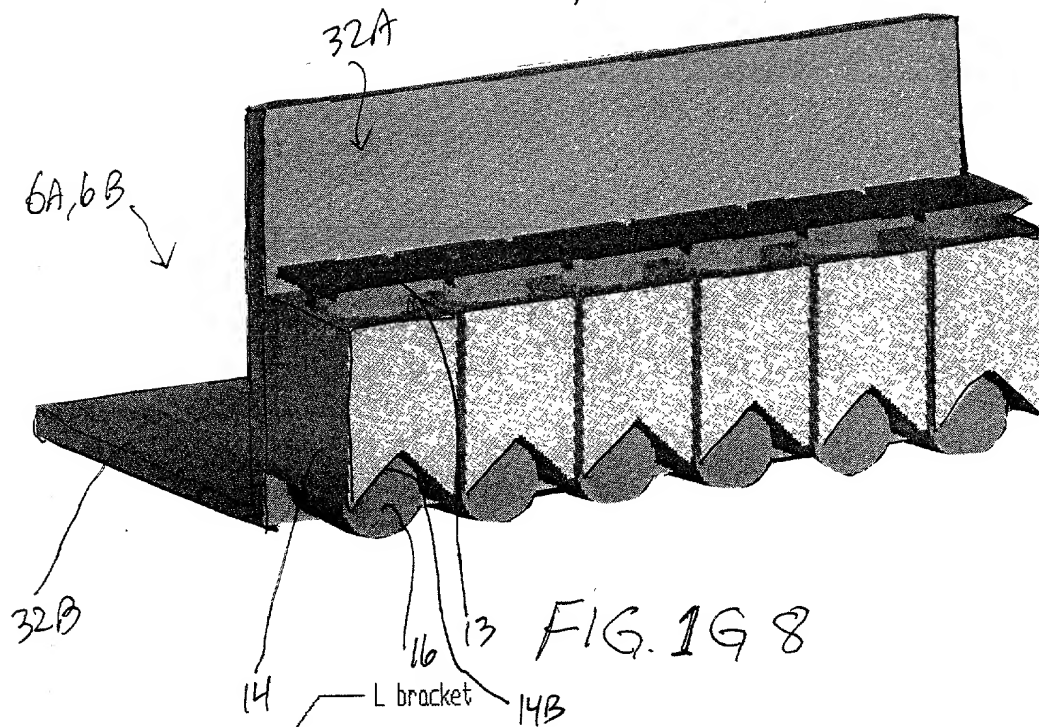
* Fixed Field of Field

FIG. 1G5

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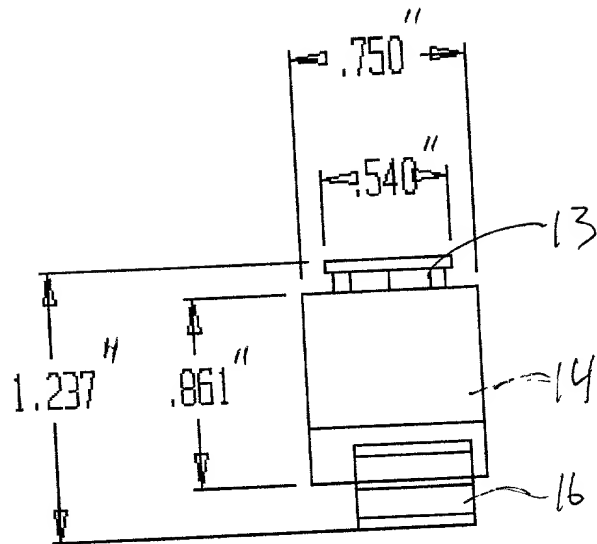


FIG. 1611

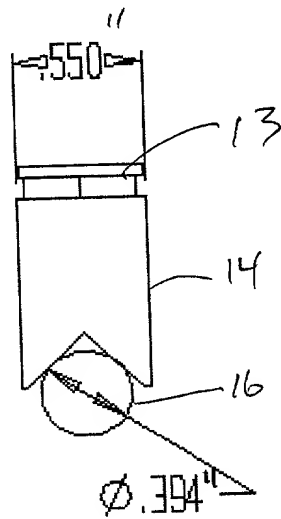


FIG. 1612

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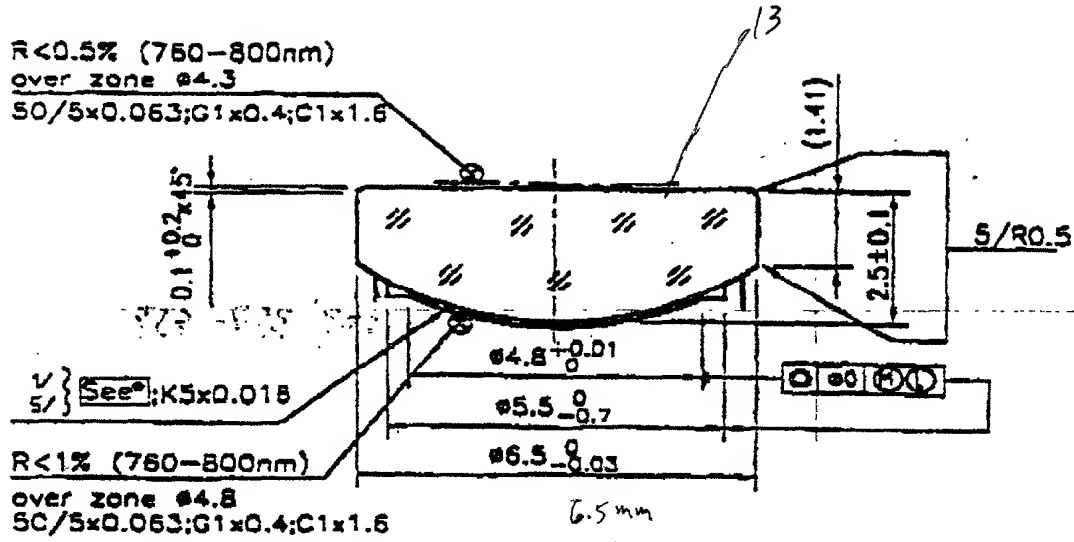


FIG. 1G13

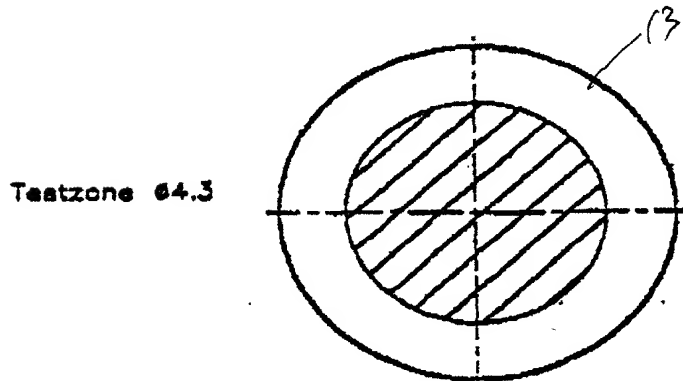


FIG. 1G14

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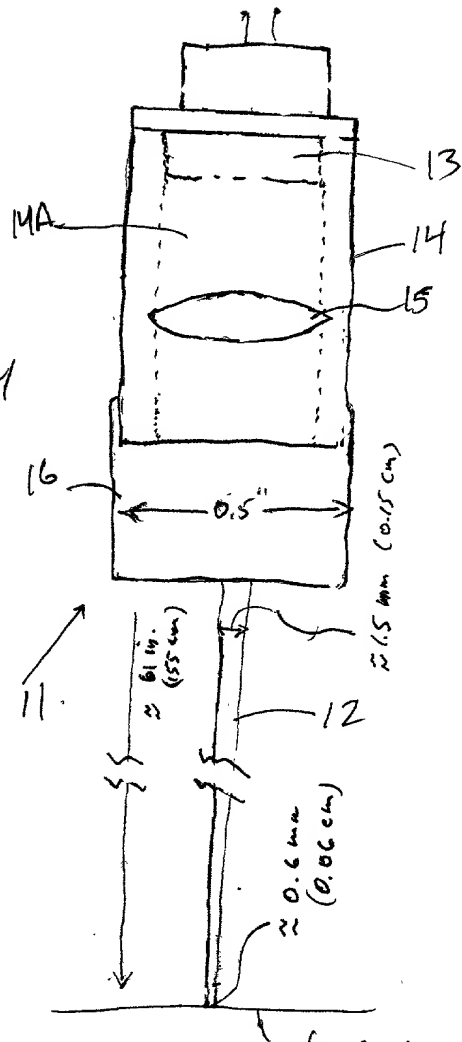
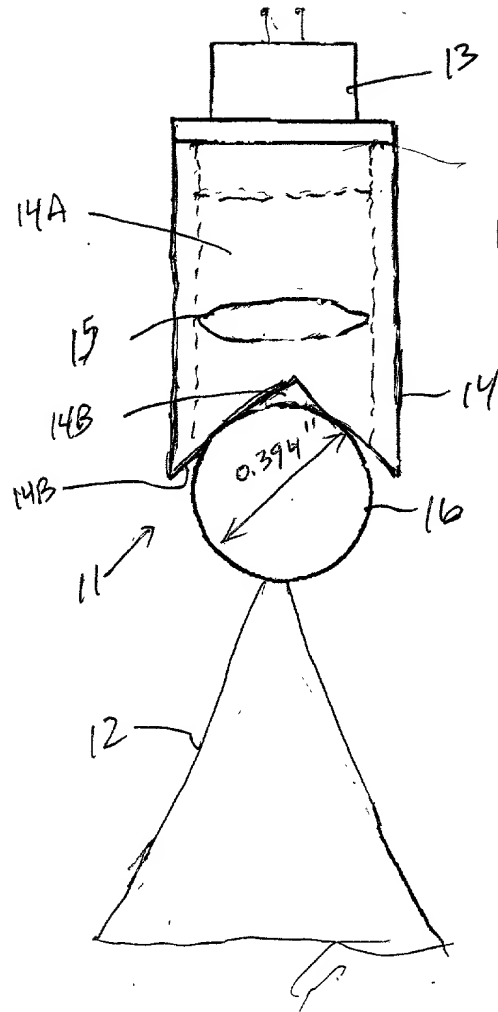


FIG. 1G15A

FIG. 1G15B

furthest
object/working
distance

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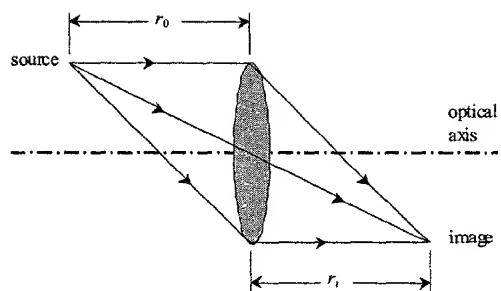


FIG. 1H1

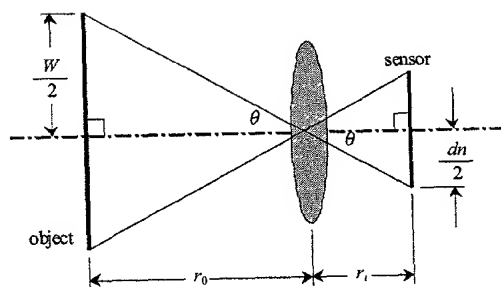


FIG. 1H2

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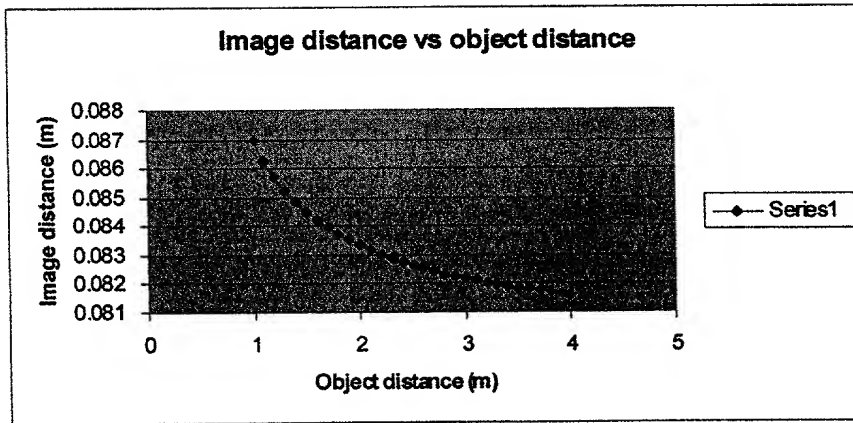


FIG. 1H3

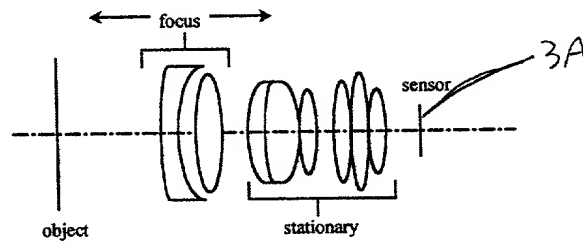


FIG. 1H4

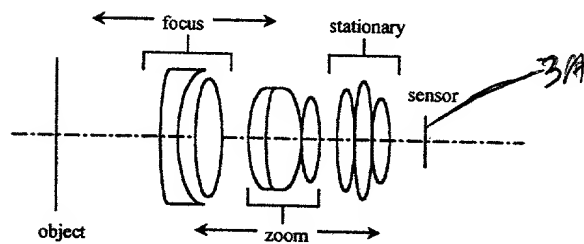


FIG. 1H5

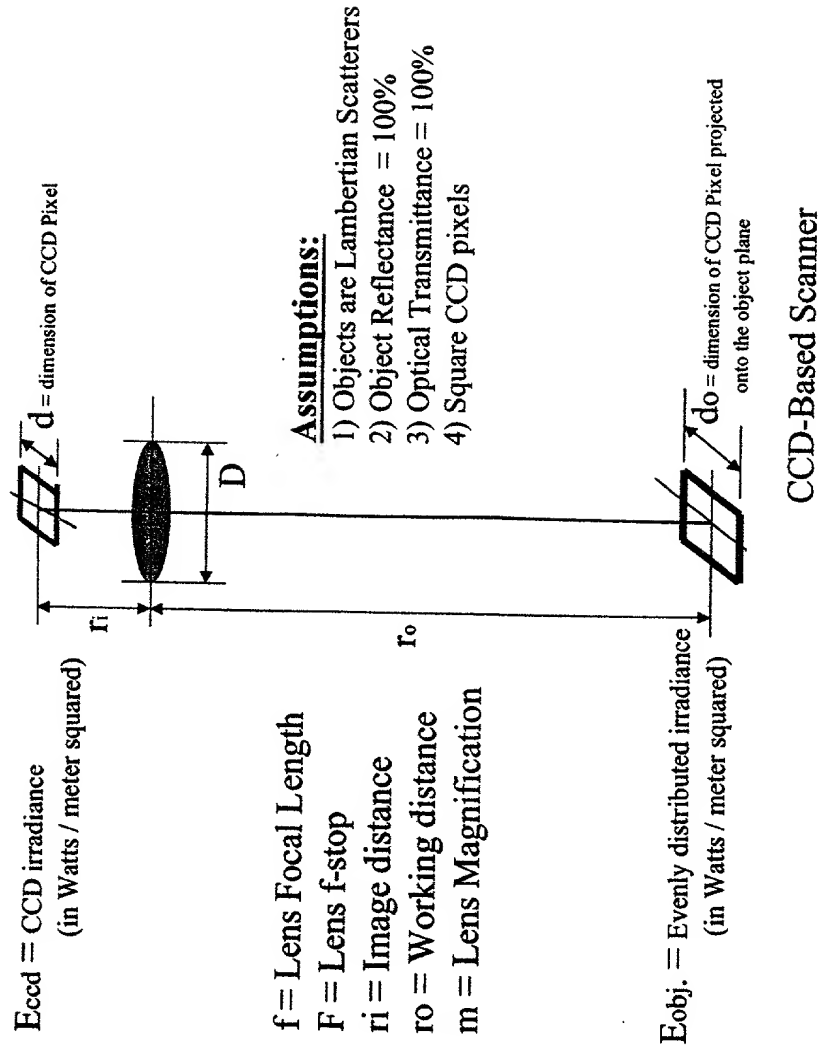


FIG. 1H6

FIRST GENERALIZED METHOD
OF REDUCING SPECKLE-NOISE
PATTERNS AT IMAGE
DETECTION ARRAY OF THE
SPM SYSTEM (3)

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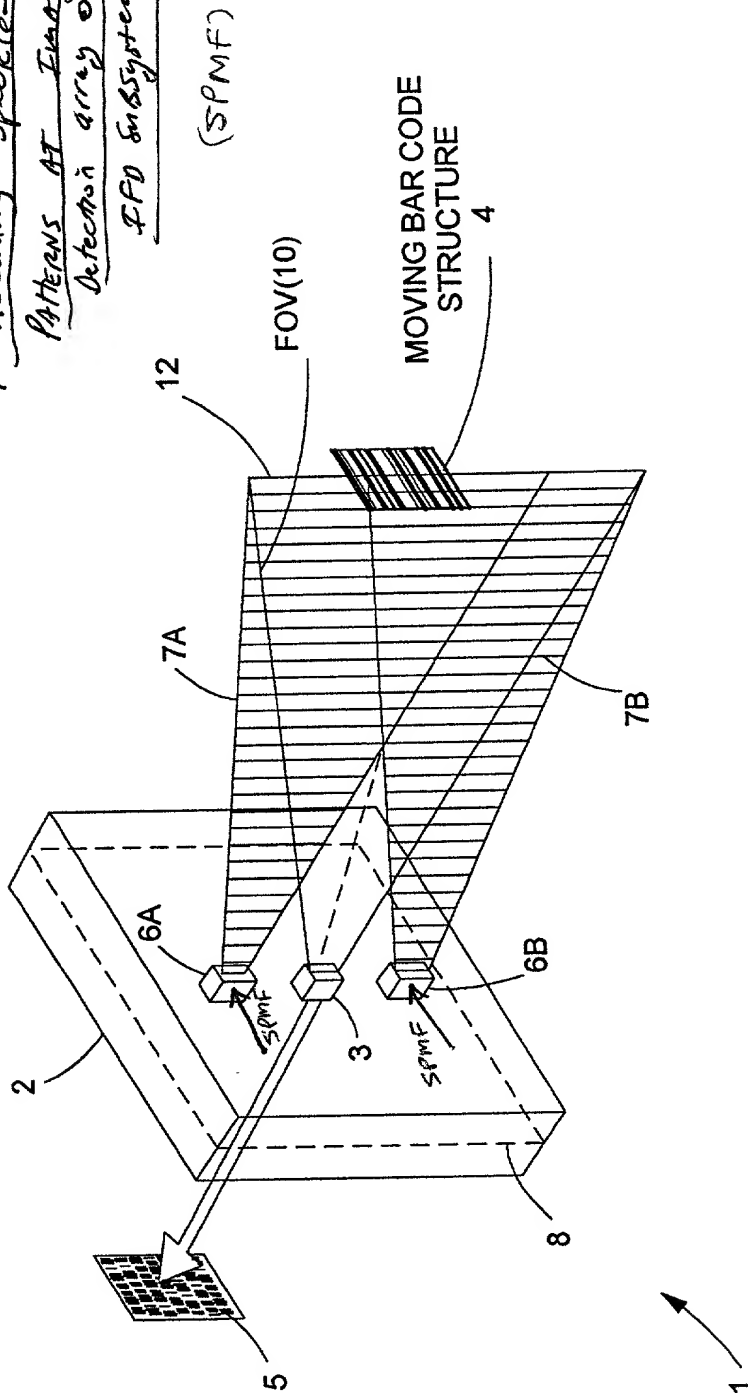


FIG. 1I1

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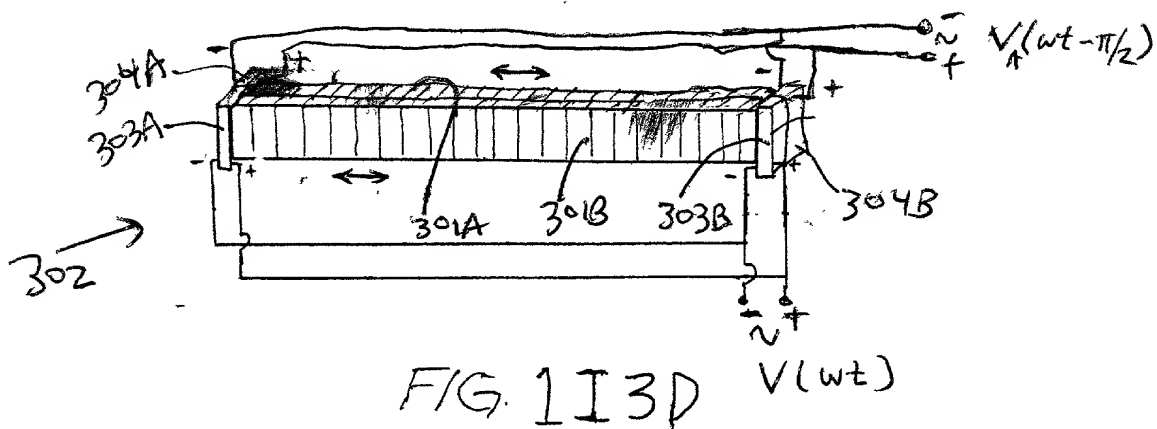
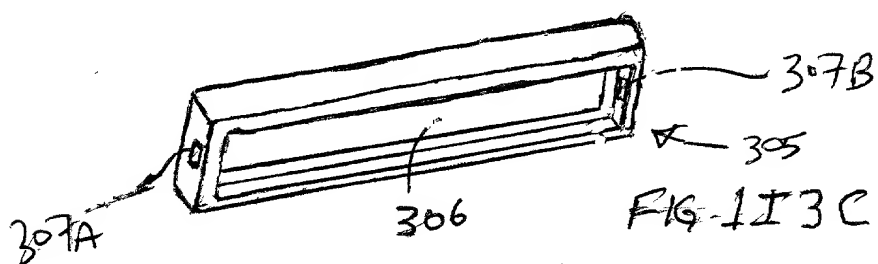
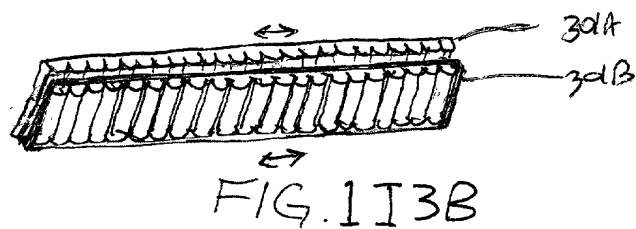
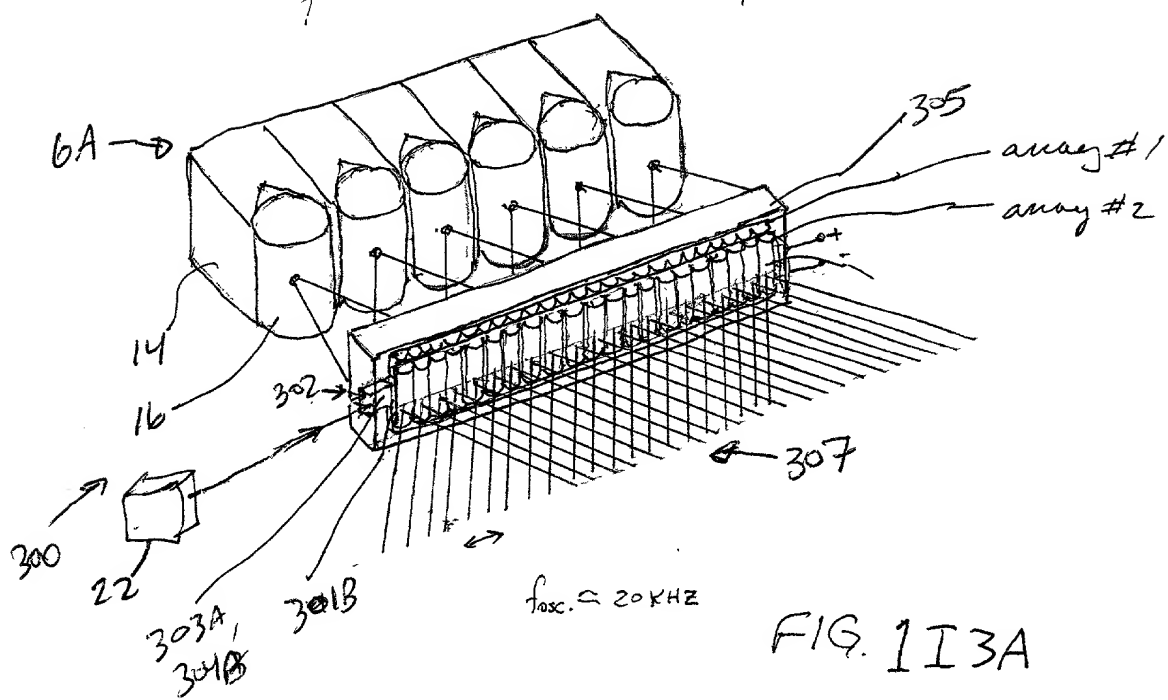
The First Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial phase of the transmitted PLIB along the planar extent thereof according to a spatial phase modulation function (SPMF) so as to modulate the phase along the wavefront of the transmitted PLIB and produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

↓

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the power of the speckle-noise pattern observed at the image detection array.

FIG. 1I2B



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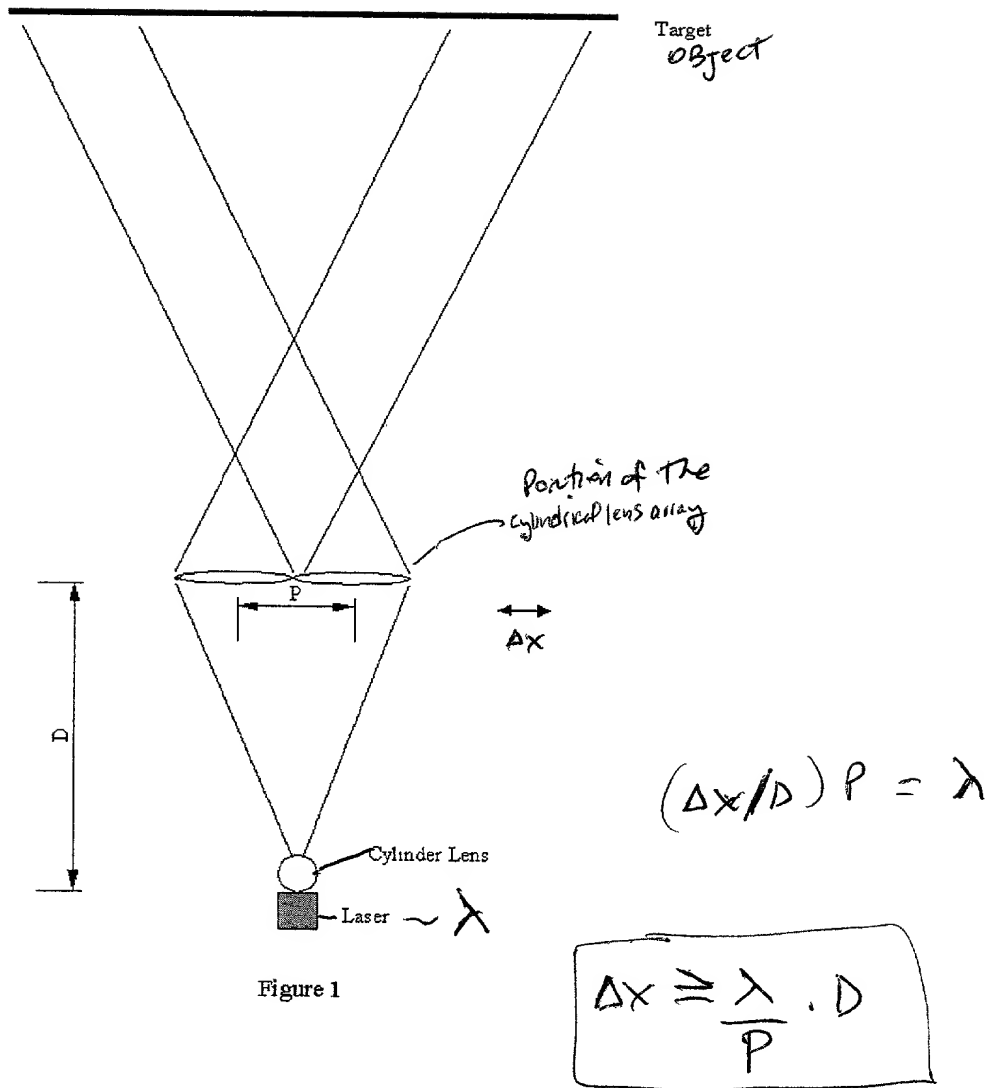
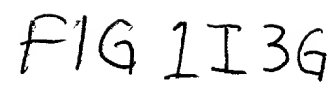
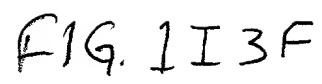
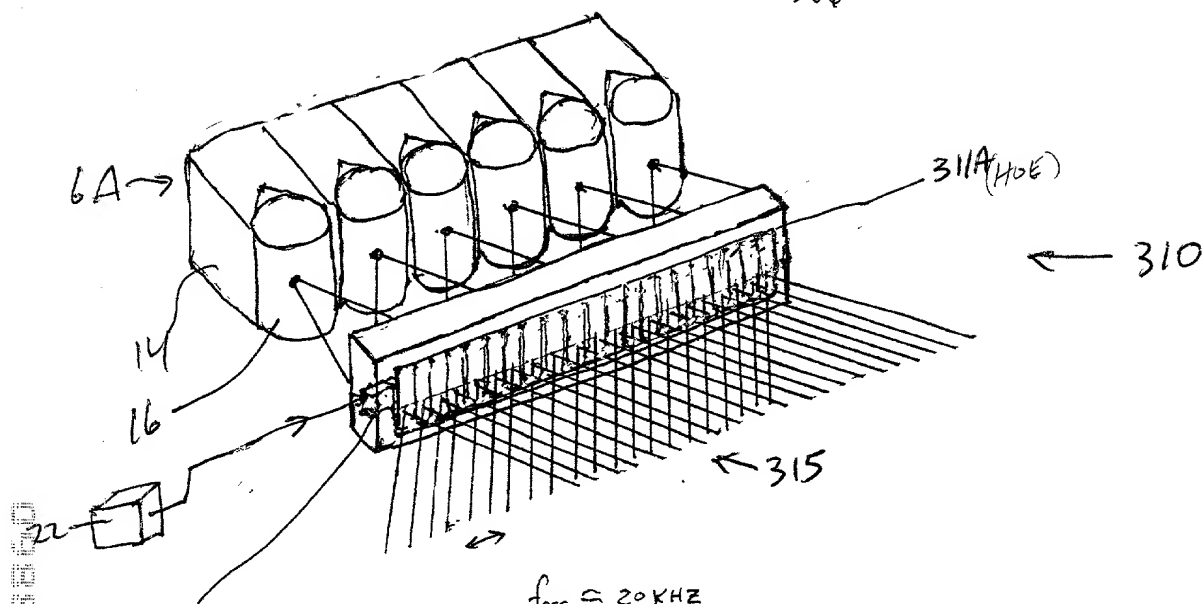


FIG. 1I3E

[illegible]

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$f_{osc} \approx 20 \text{ KHZ}$

FIG. 1I4A

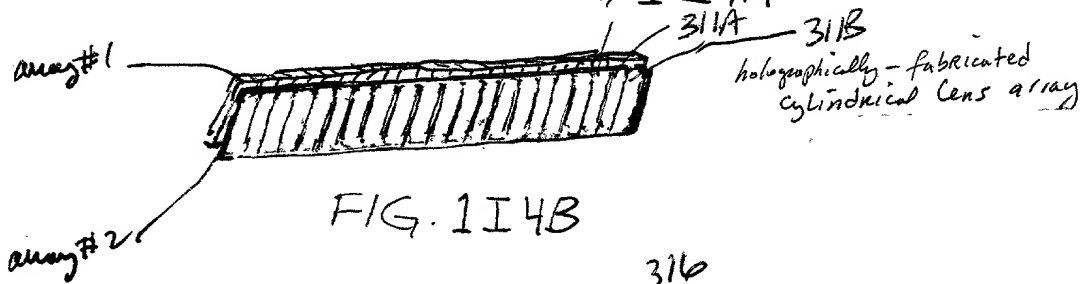


FIG. 1I4B

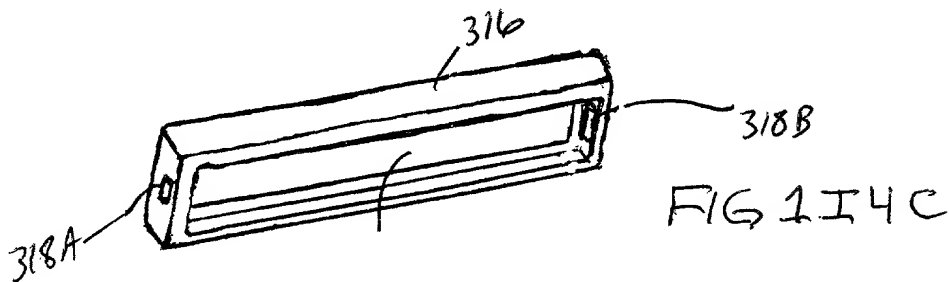


FIG. 1I4C

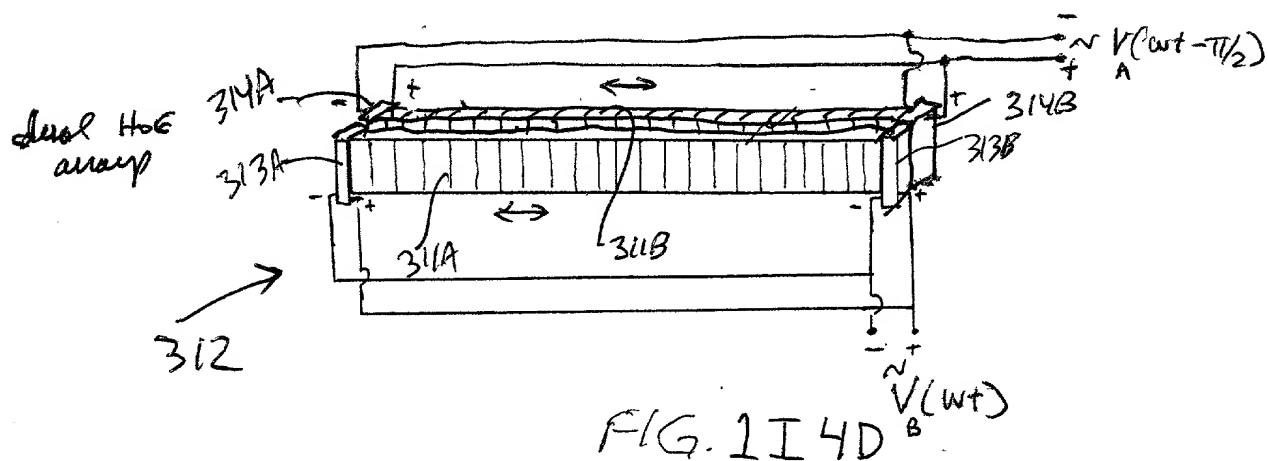
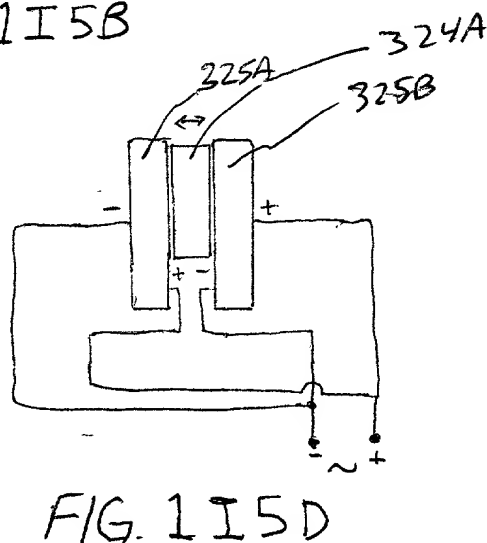
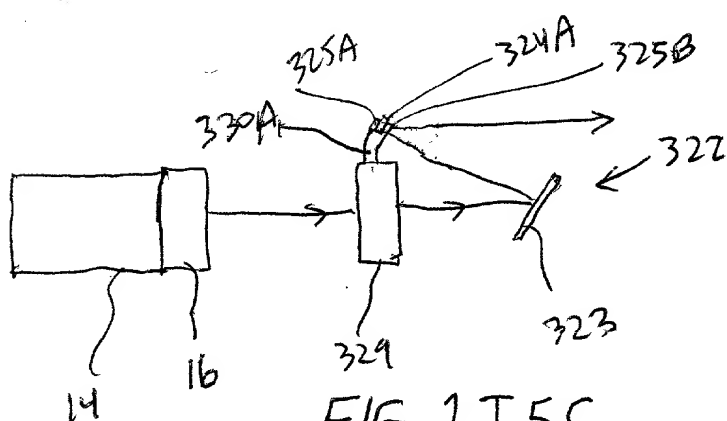
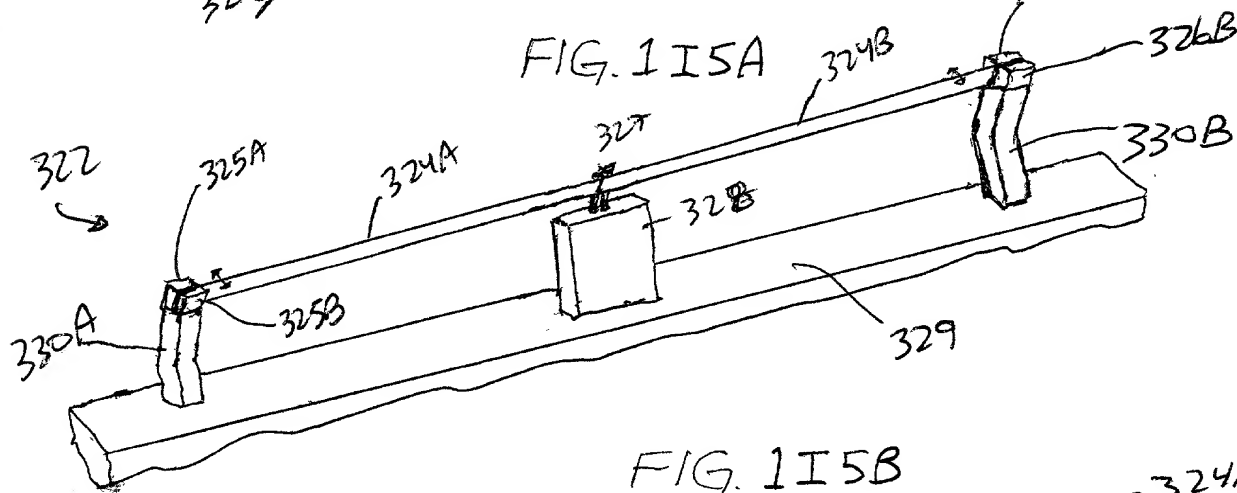
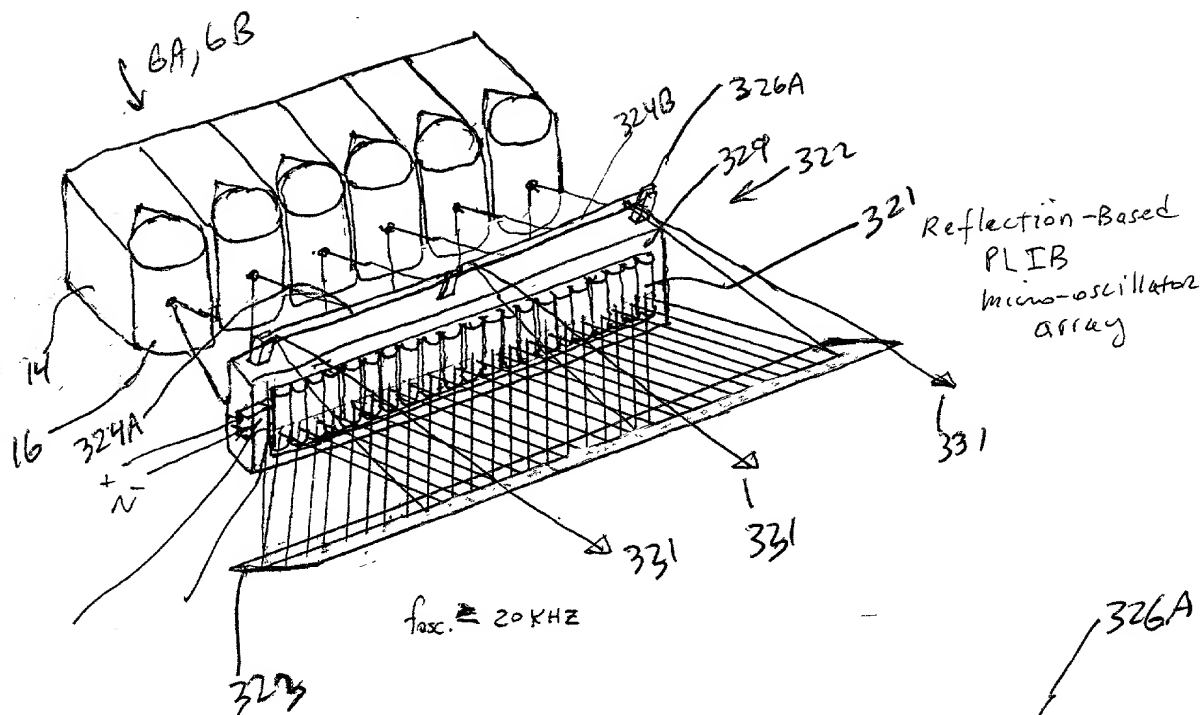
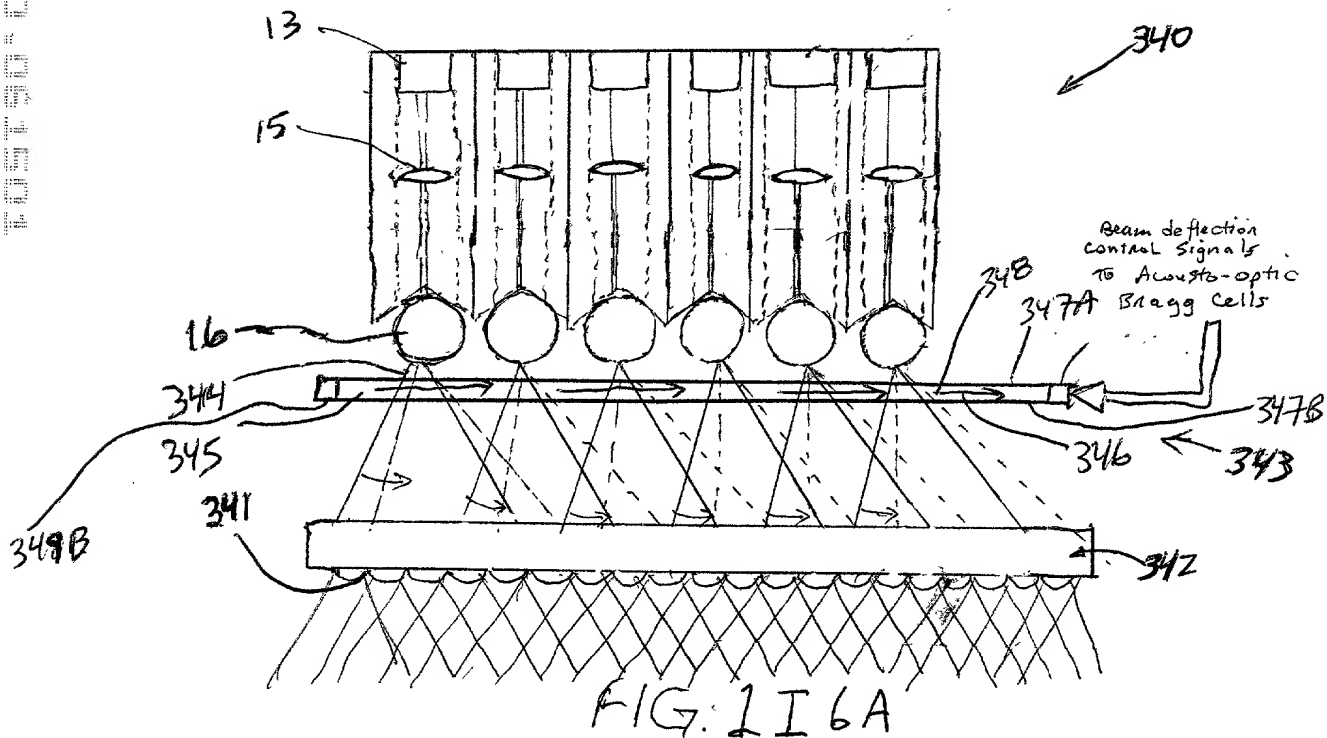
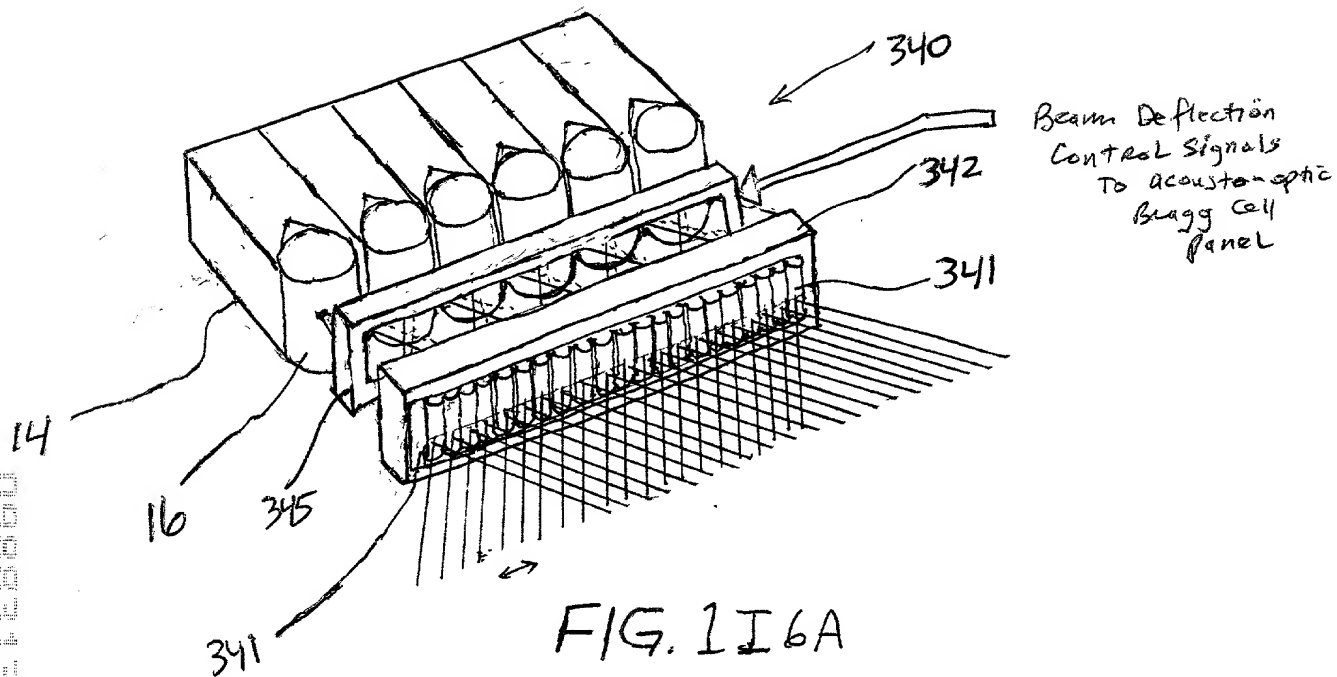


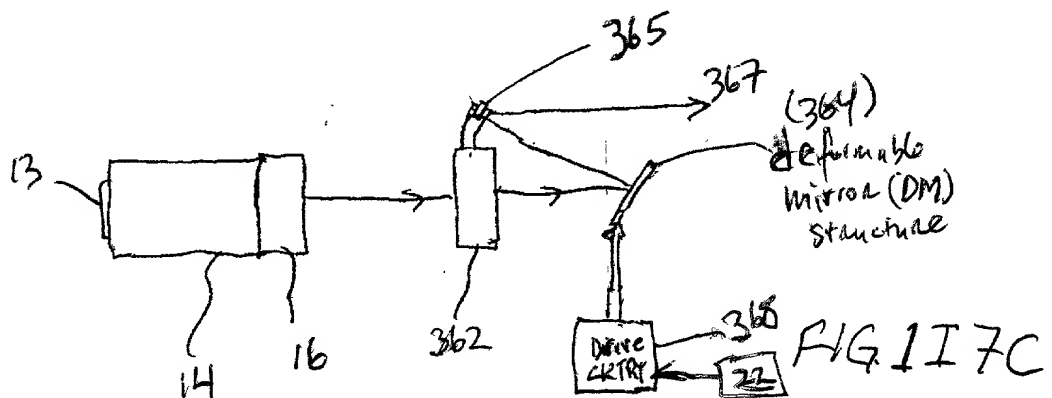
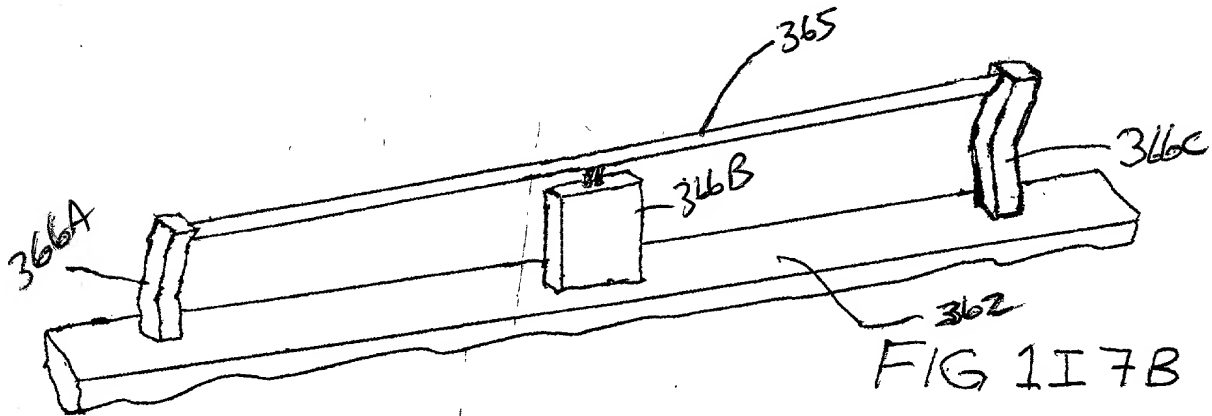
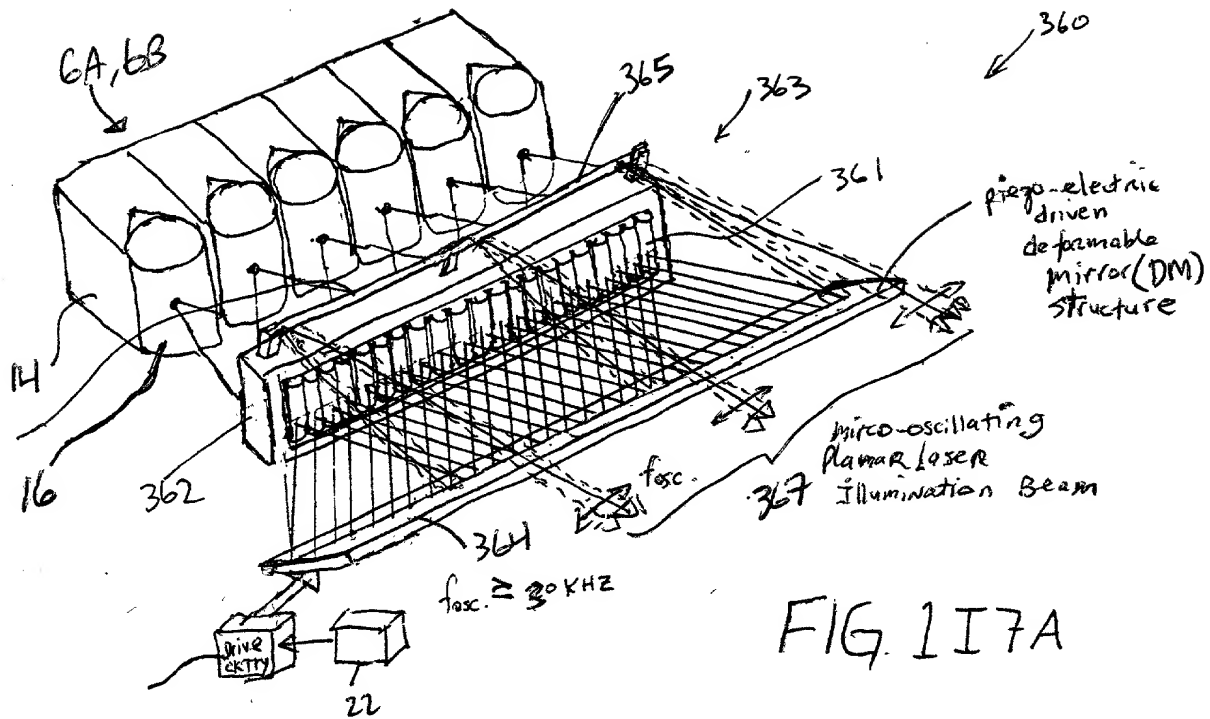
FIG. 1I4D

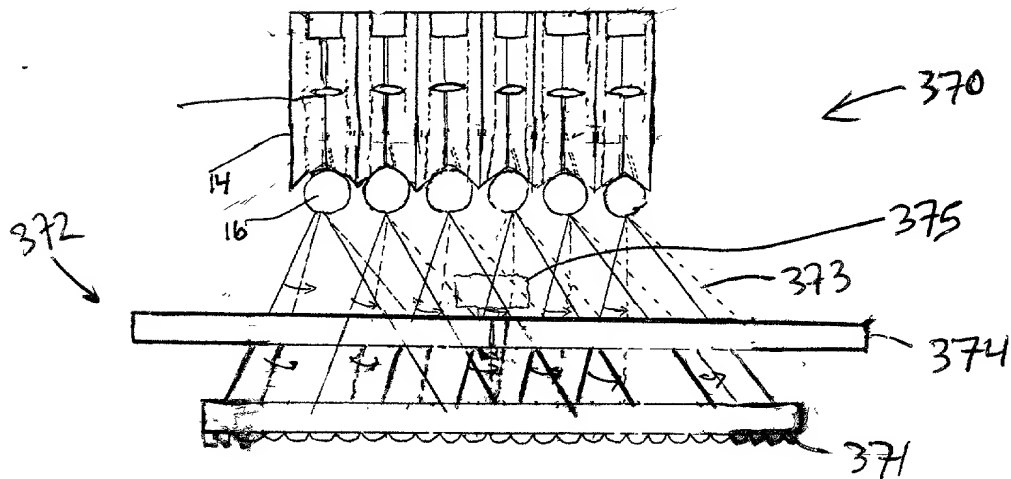
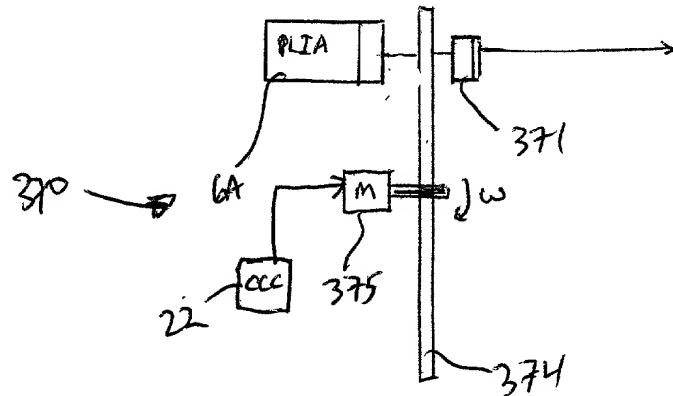
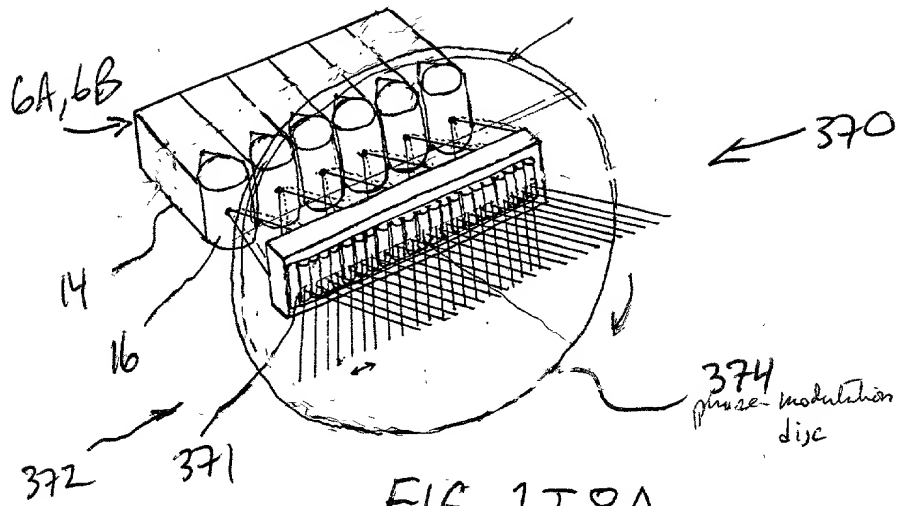
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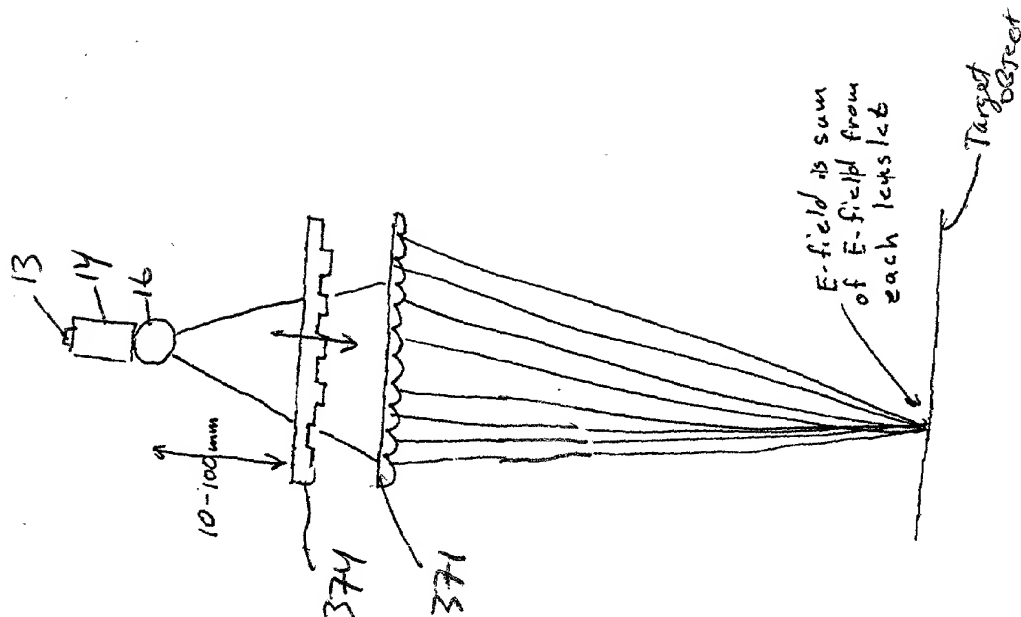


FIG 1I8E

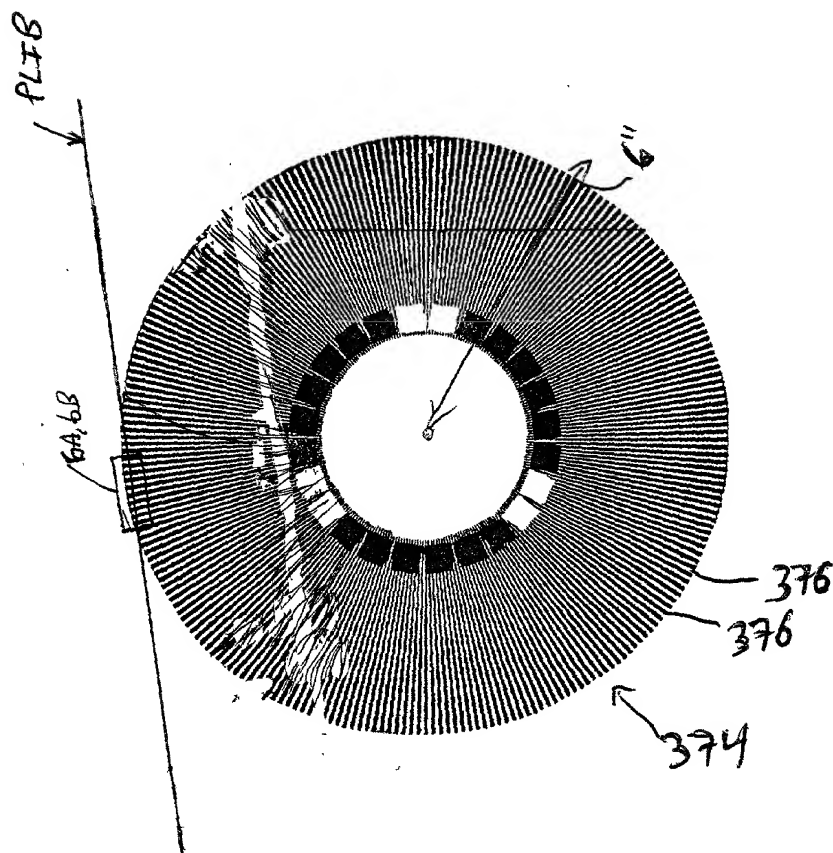
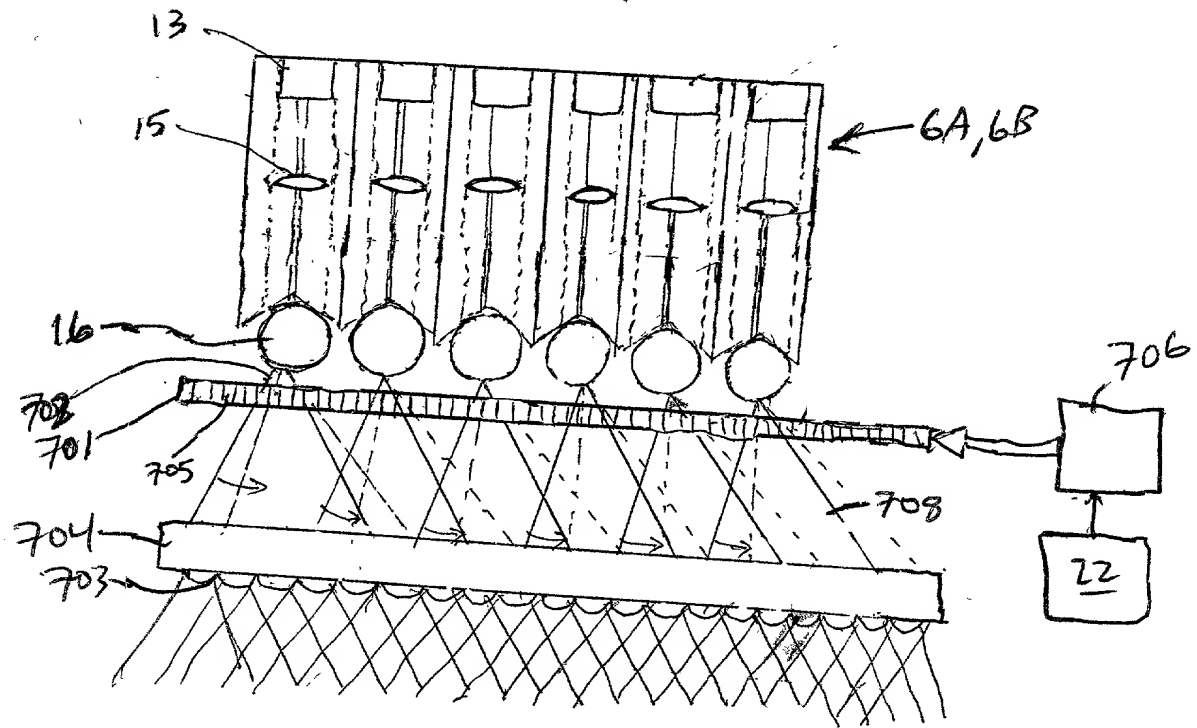
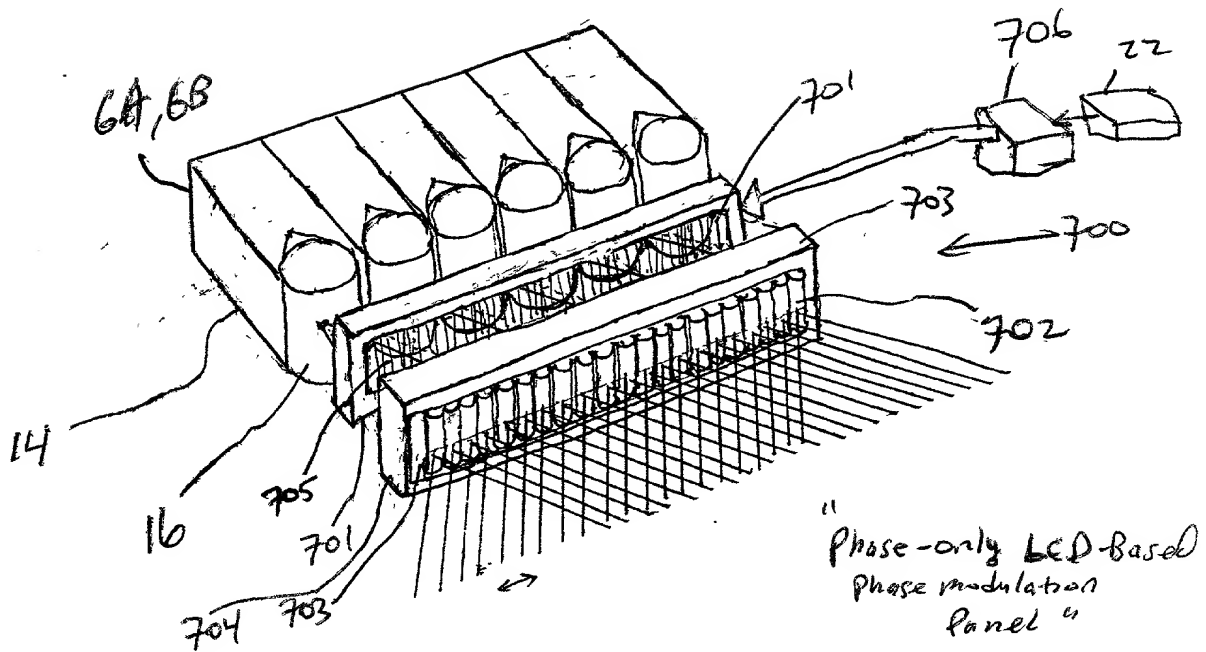


FIG 1I8D



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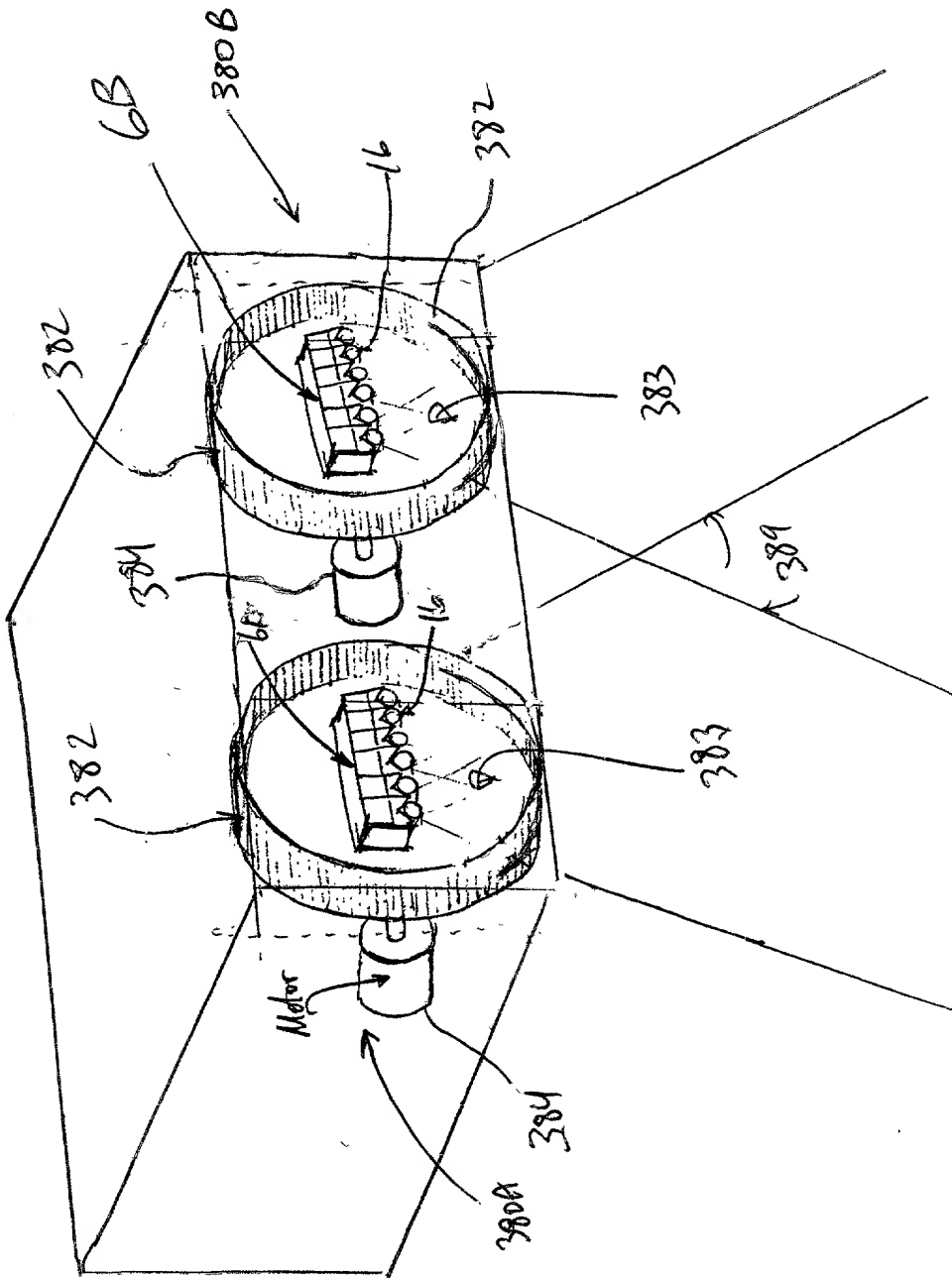
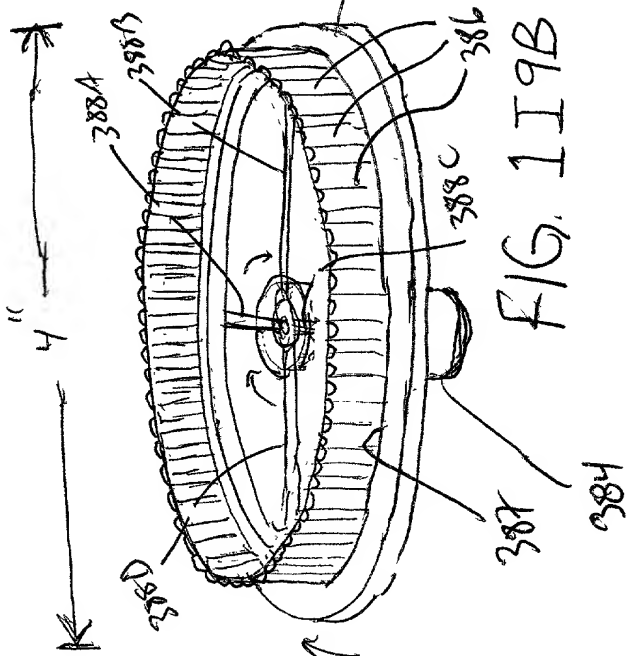


FIG. 119A

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Optical Specifications:

- 30 cylindrical lens (lenses) per linear inch
- focal length : 2.0 millimeters
- diameter of lens carrier carousel ≈ 4 inches
- acrylic material
- lens carrier cylindrical element on inside diameter



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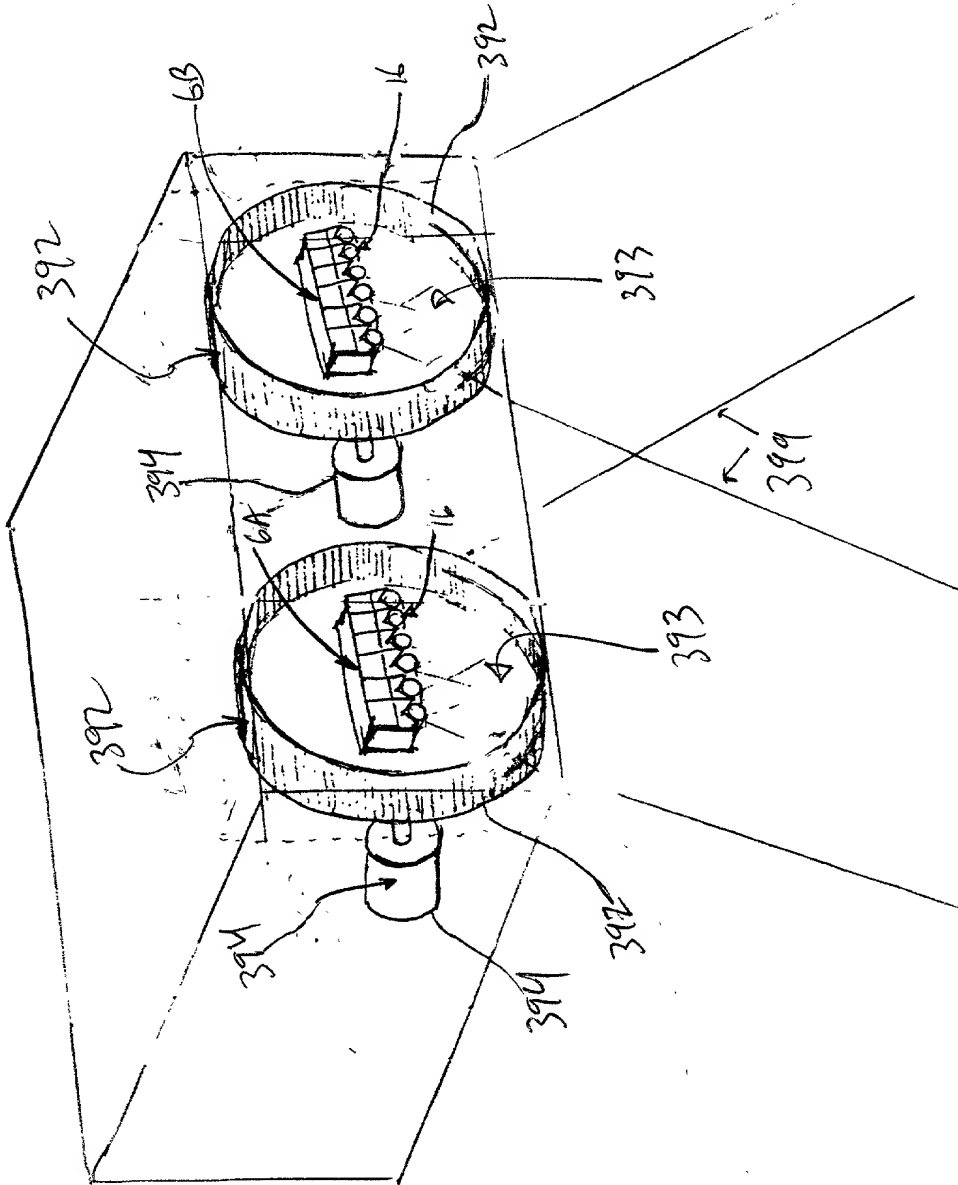


FIG. 1I10A

Optical Specifications

4" →

- 30 cylindrical lens (lenses) per linear inch
- field length : 2.0 millimeters
- diameter of cylindrical carousel ≈ 4 inches
- acrylic material
- cylindrical cylindrical elements on inside diameter

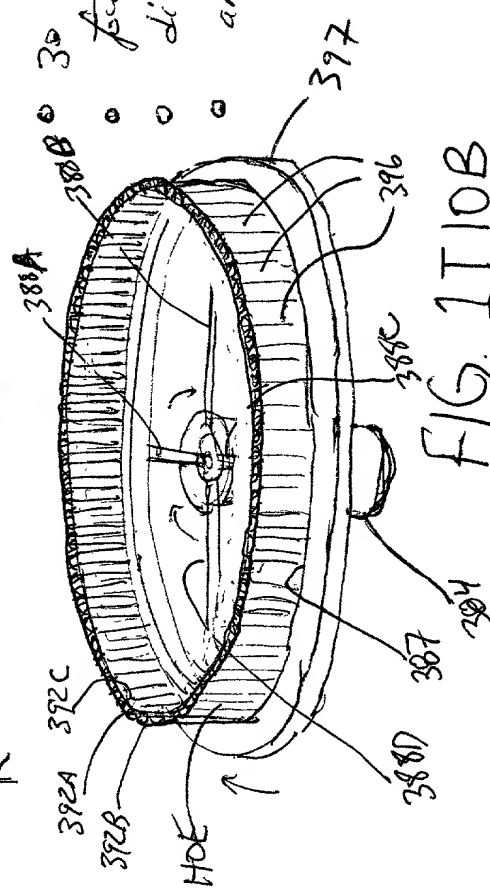


FIG. 1110B

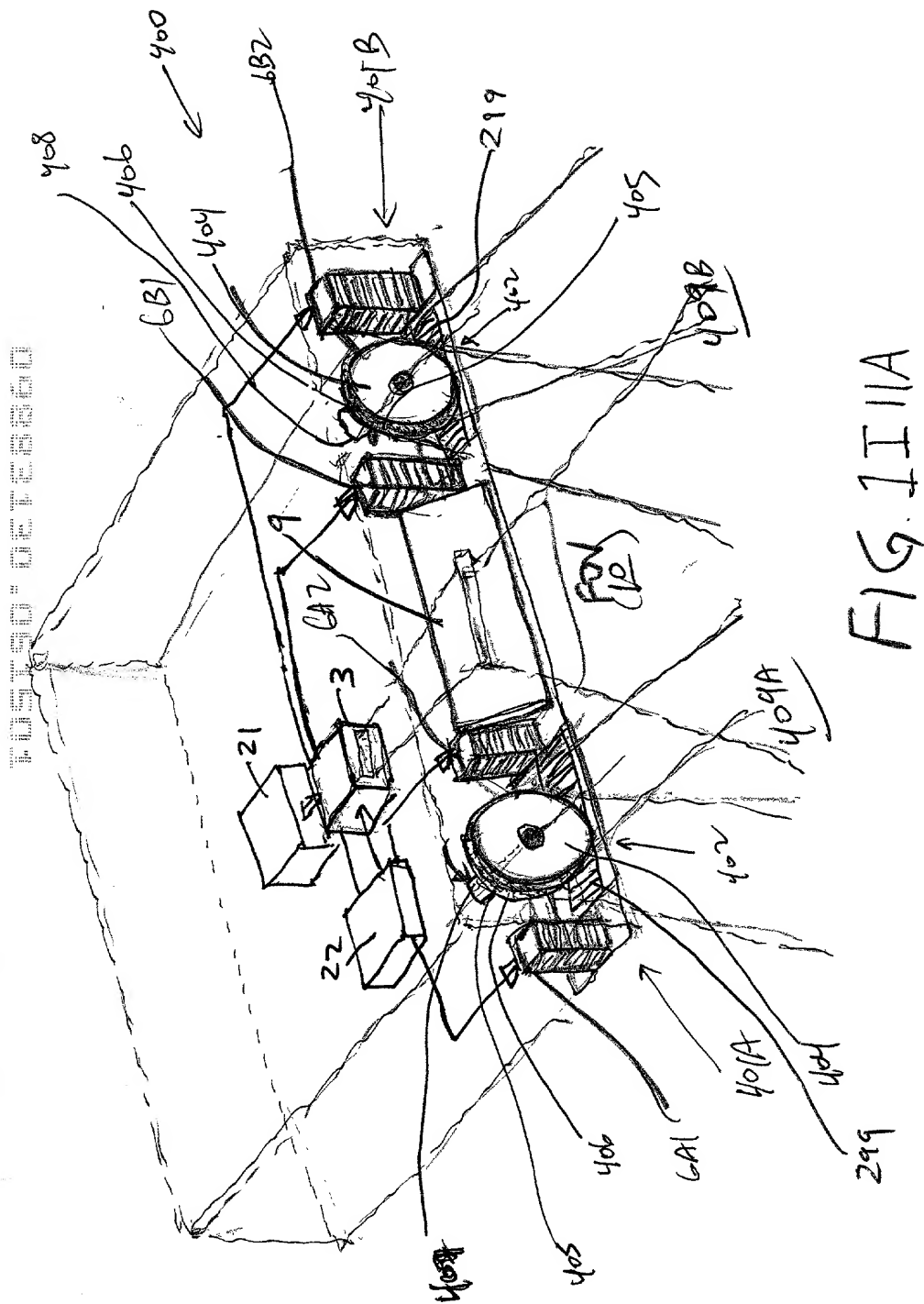


FIG. 1I IIA

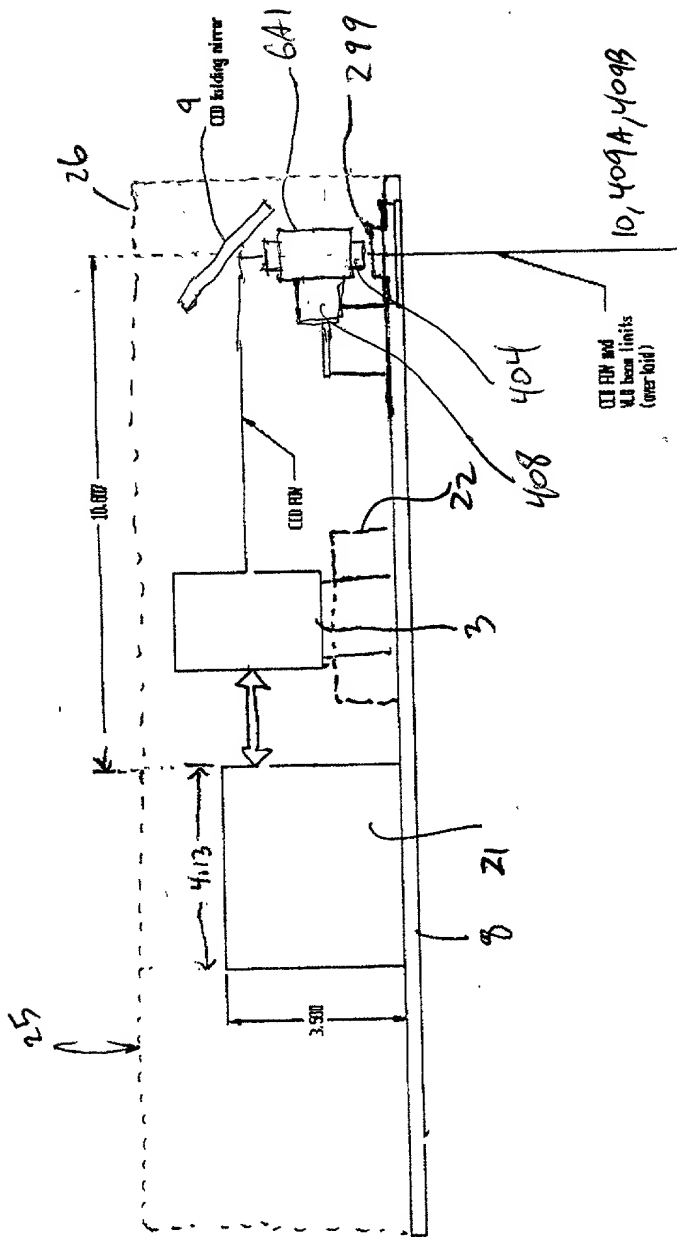


FIG 1 I 1 B

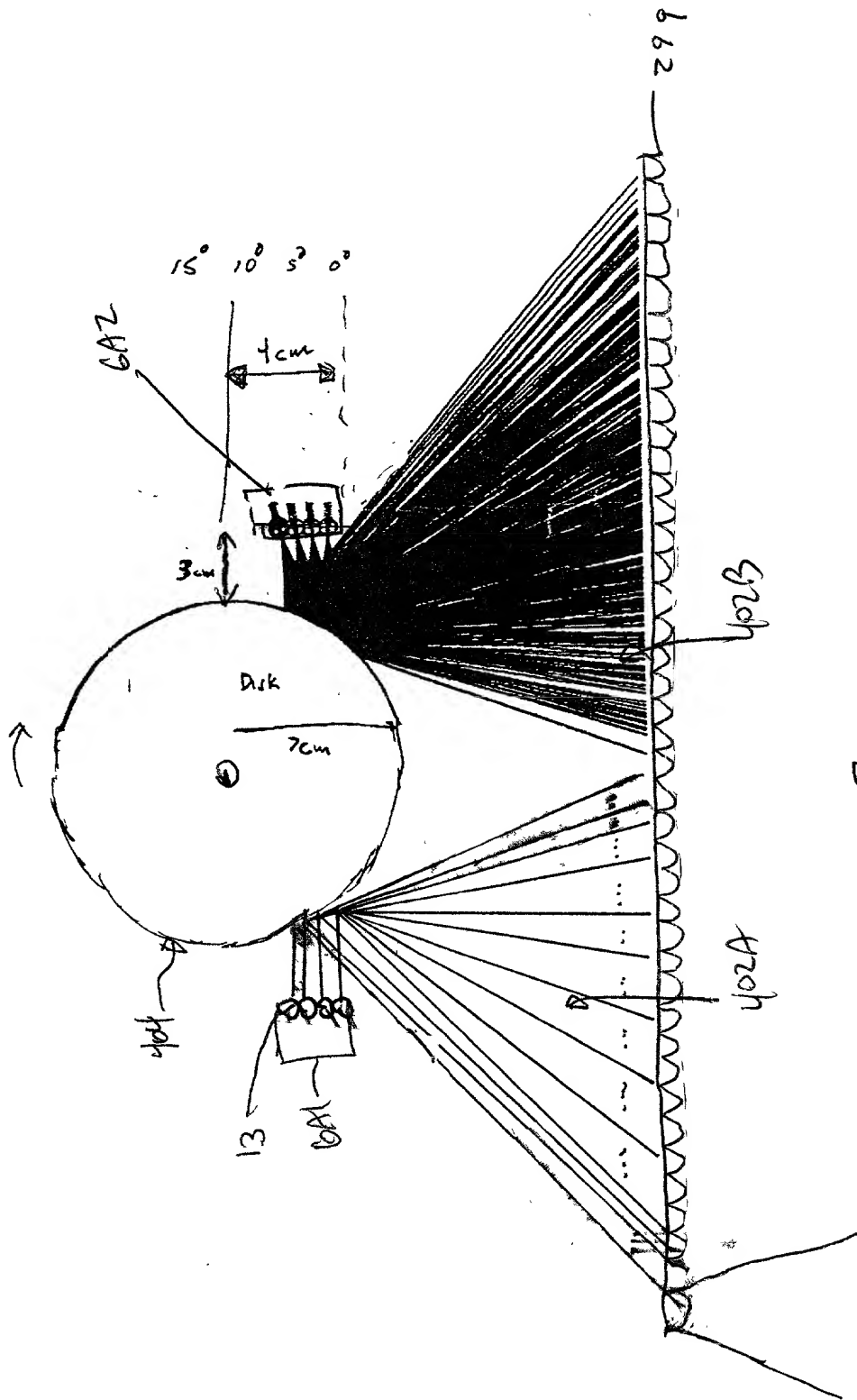


FIG. 111C

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Second Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of the FFD Subsystem (3)

(TIME)

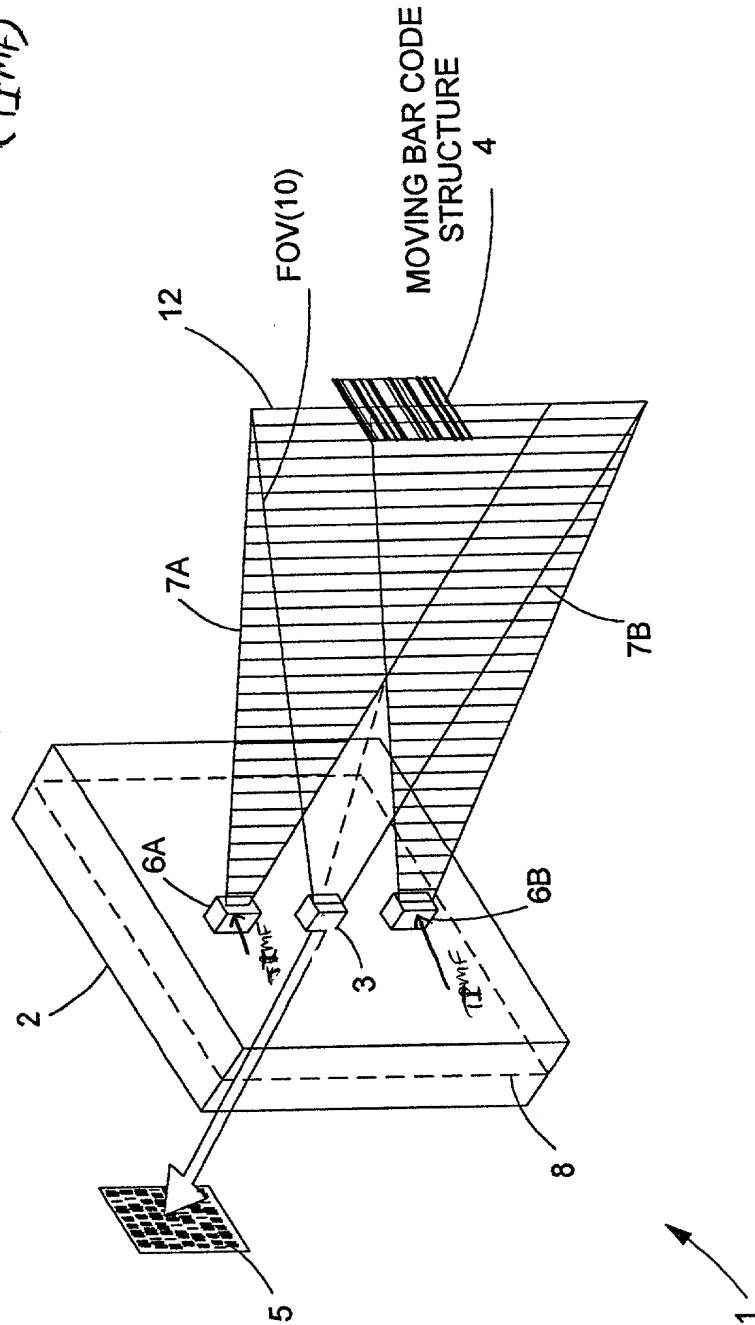


FIG. 1 I 12

Variable	Mean	Standard deviation	Minimum	Maximum	Skewness	Kurtosis	Jarque-Bera	Probability
Age	34.50	10.50	20	65	-0.05	3.00	0.95	0.61
Gender	0.50	0.50	0	1	0.00	3.00	0.95	0.61
Married	0.70	0.45	0	1	0.00	3.00	0.95	0.61
Children	1.50	1.00	0	5	0.00	3.00	0.95	0.61
Religion	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Education	12.00	2.00	8	16	0.00	3.00	0.95	0.61
Occupation	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Income	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Health	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Smoking	0.50	0.50	0	1	0.00	3.00	0.95	0.61
Drinking	0.50	0.50	0	1	0.00	3.00	0.95	0.61
Exercise	0.50	0.50	0	1	0.00	3.00	0.95	0.61
Stress	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Depression	0.50	0.50	0	1	0.00	3.00	0.95	0.61
Loneliness	0.50	0.50	0	1	0.00	3.00	0.95	0.61
Social support	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Life satisfaction	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Quality of life	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Health-related quality of life	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Physical health	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Mental health	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Overall health	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Life expectancy	75.00	10.00	60	90	0.00	3.00	0.95	0.61
Healthcare costs	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Health insurance	0.50	0.50	0	1	0.00	3.00	0.95	0.61
Healthcare access	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare quality	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare satisfaction	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare utilization	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare expenditure	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare financing	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare management	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare reform	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare policy	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare legislation	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare regulation	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare supervision	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare enforcement	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare compliance	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare accountability	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare transparency	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare integrity	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare honesty	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare fairness	1.00	0.80	0	2	0.00	3.00	0.95	0.61
Healthcare justice	1.00	0.80	0	2	0.00	3.		



FIG. 1I 13A

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The Second Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the transmitted PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to modulate the phase along the wavefront of the transmitted PLIB and produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

A

↓

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

B

FIG. 1I13B

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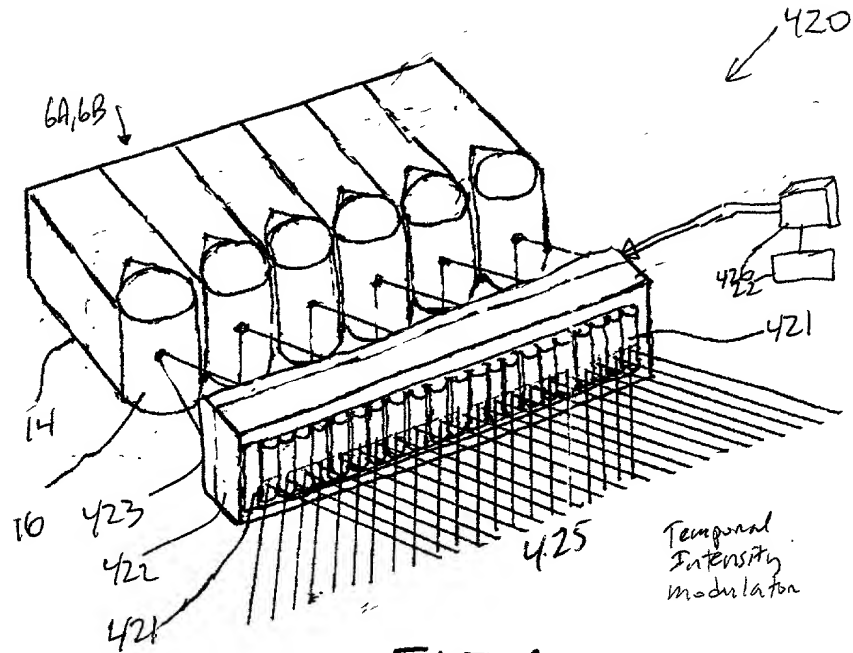


FIG. 1I14A

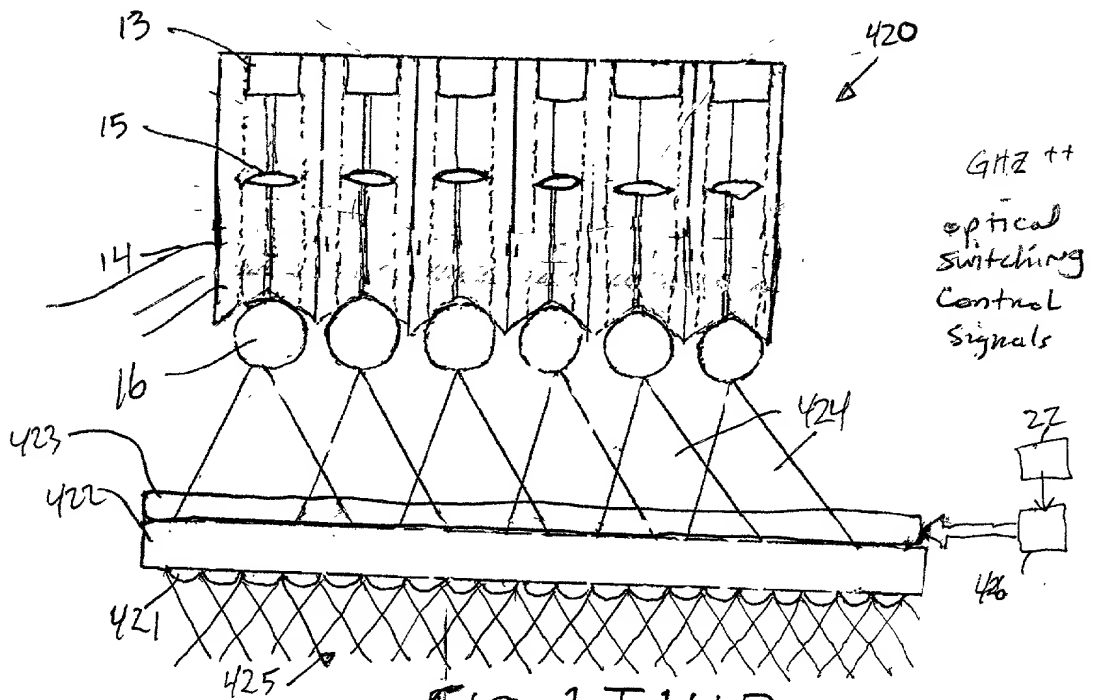


FIG. 1I14B

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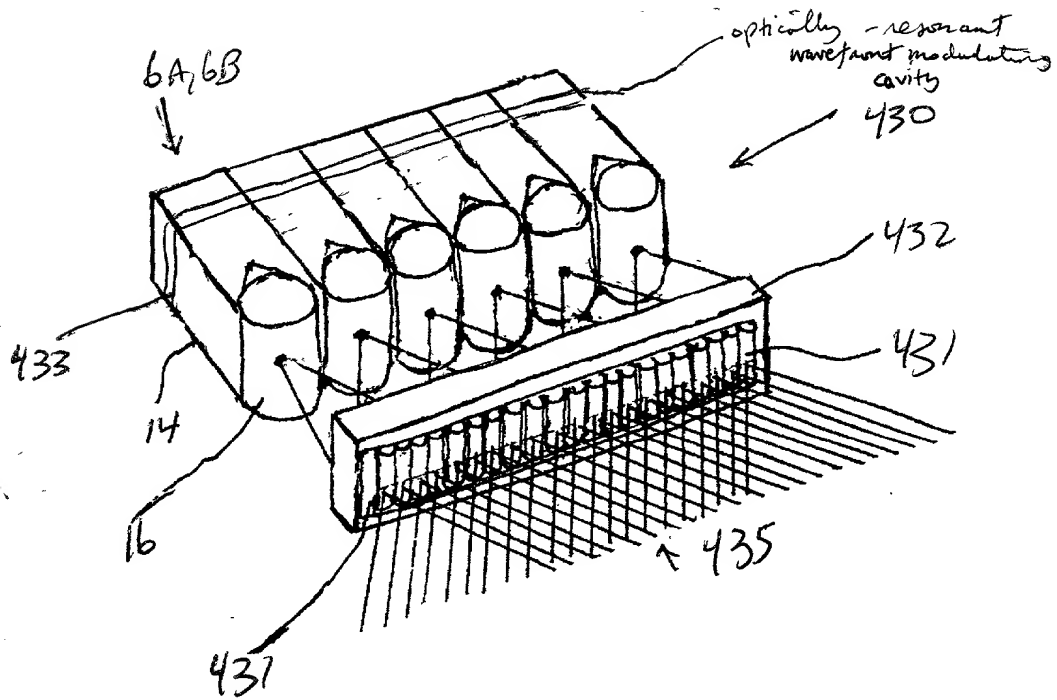


FIG. 1I15A

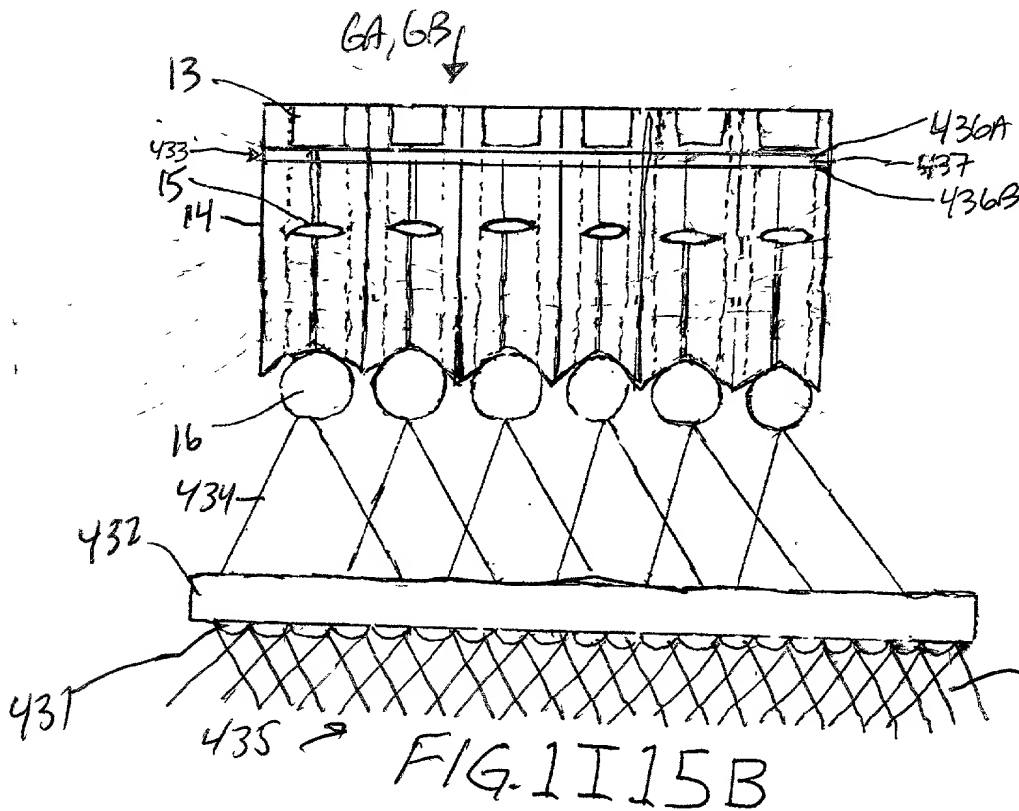
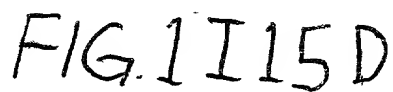
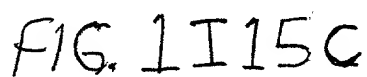


FIG. 1I15B

105490-06128860



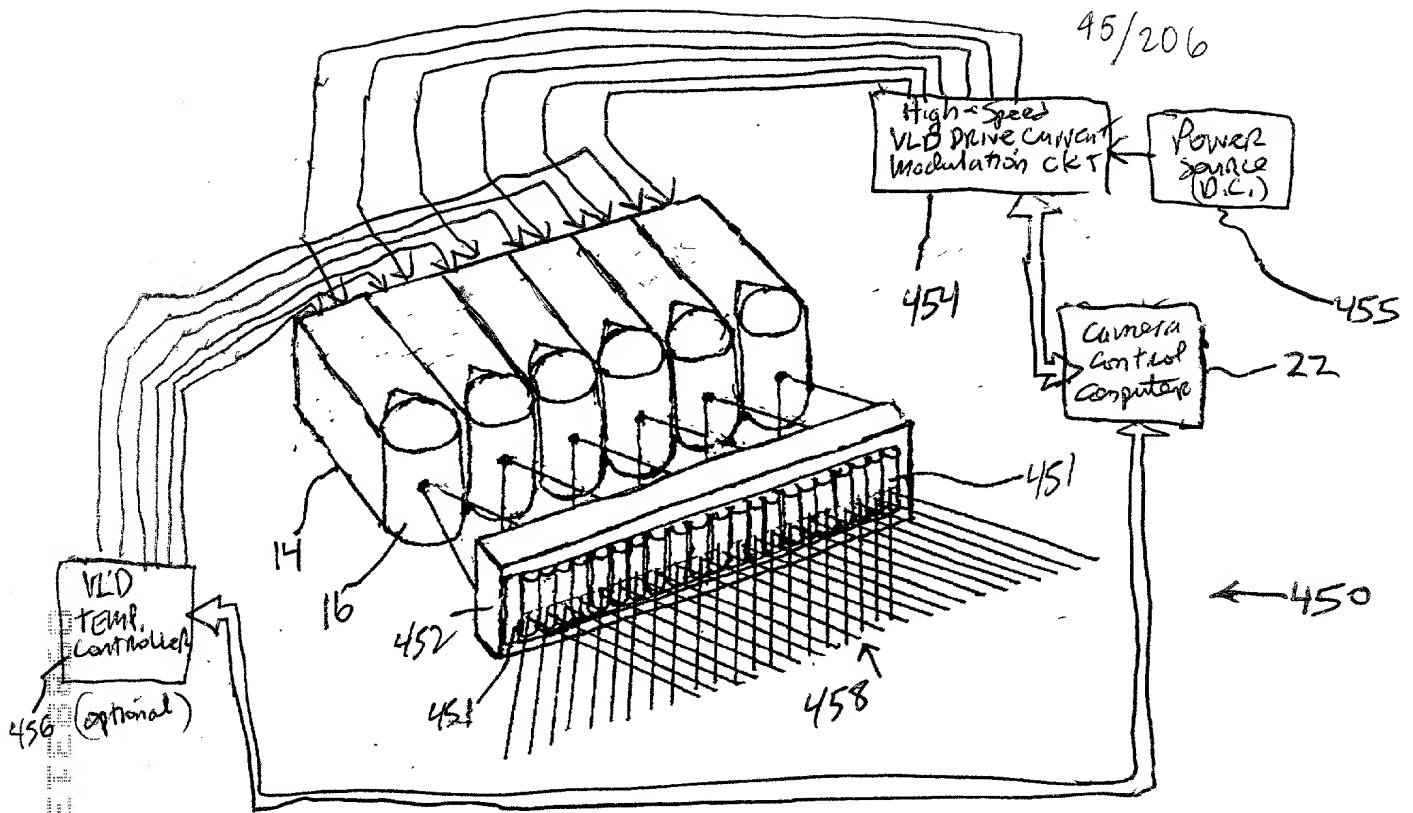


FIG. 1I16A

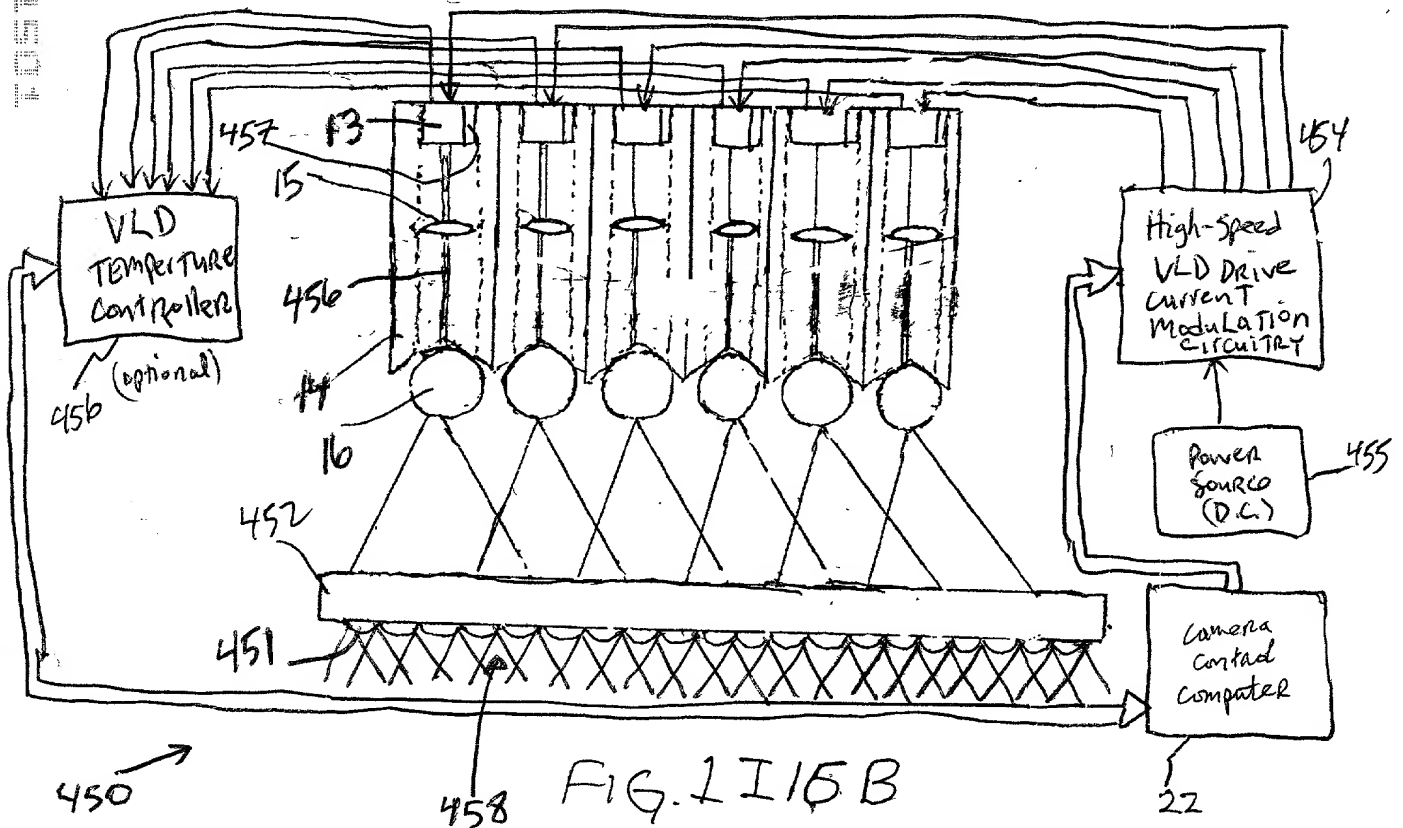


FIG. 1I16B

Third GENERALIZED METHOD
of Reducing Speckle-Noise
PATTERNS AT IMAGE
Detection array of the
IPD subsystem (3)

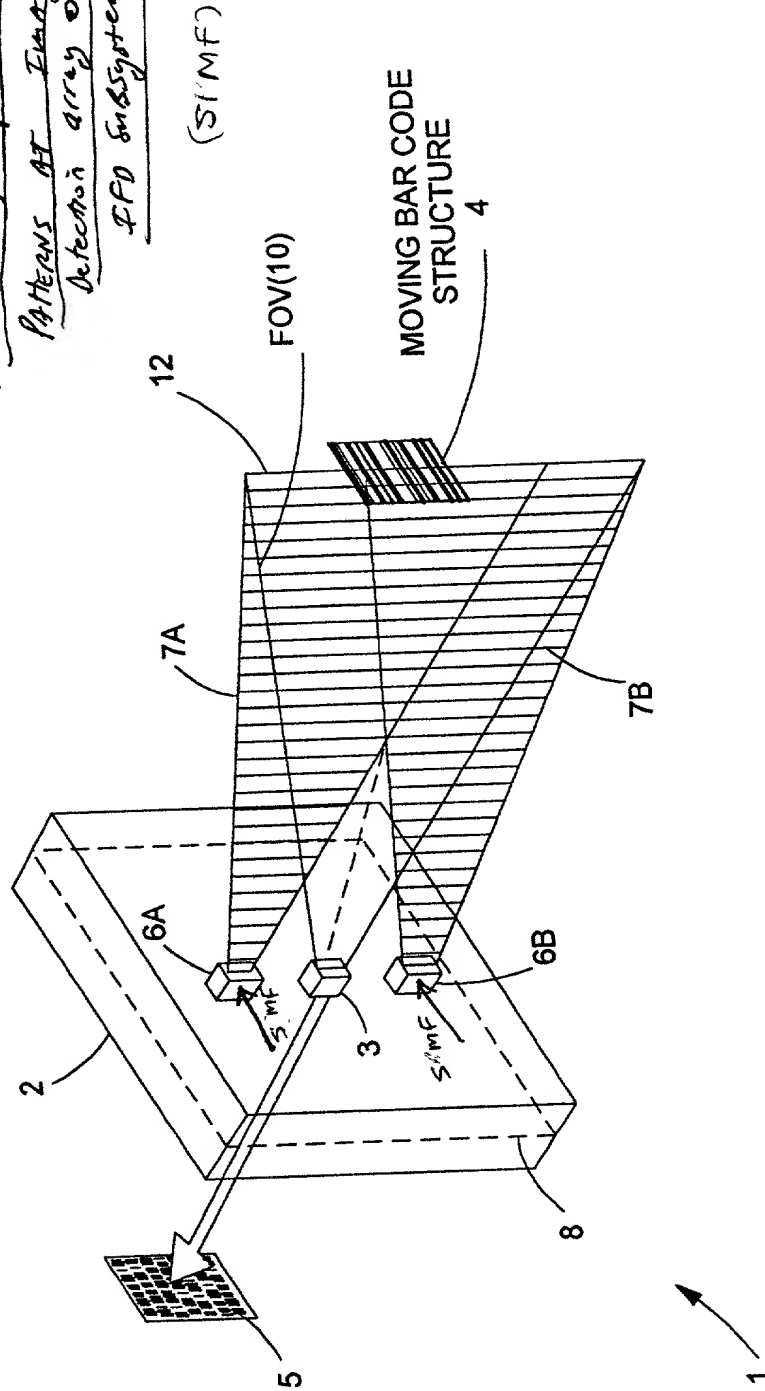
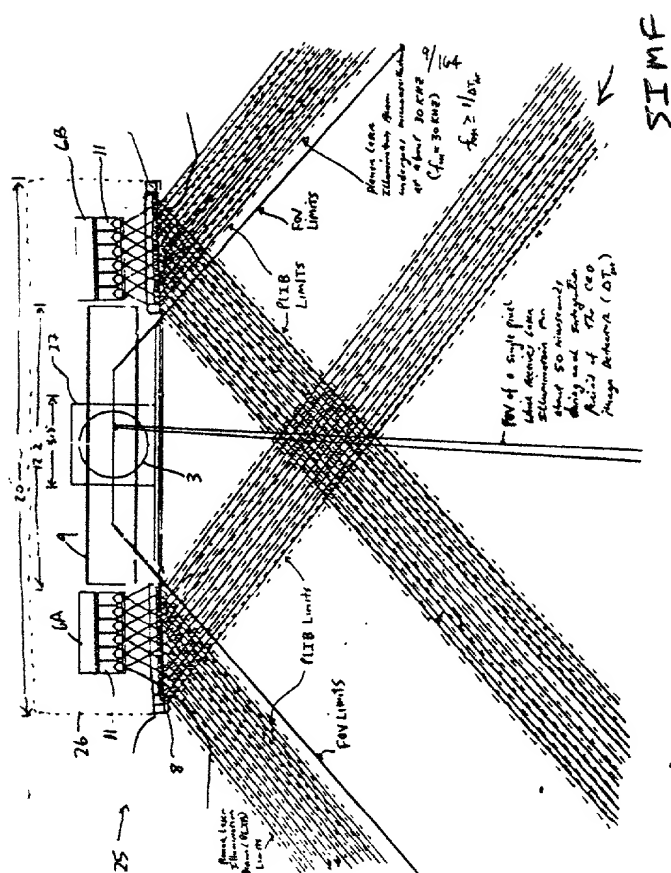


FIG. 17



Prior to object illumination

FIG 1 I 18A

The Third Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the transmitted PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to modulate the phase along the wavefront of the transmitted PLIB and produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

↓

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I18B

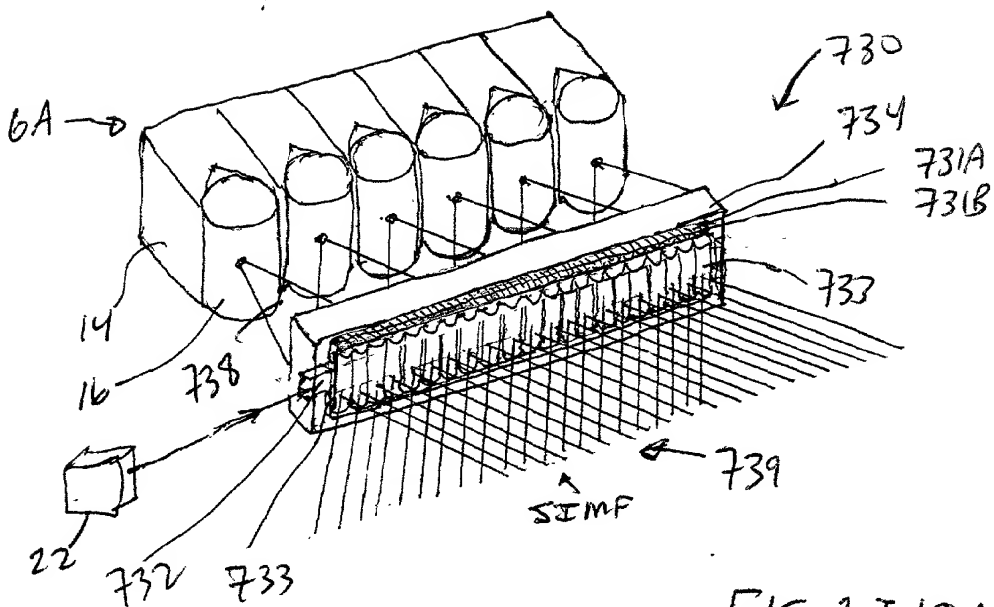


FIG. 1I19A

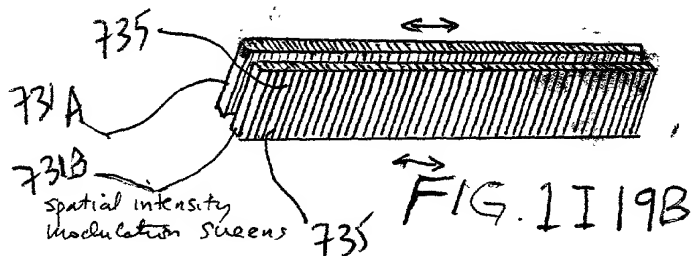


FIG. 1I19B

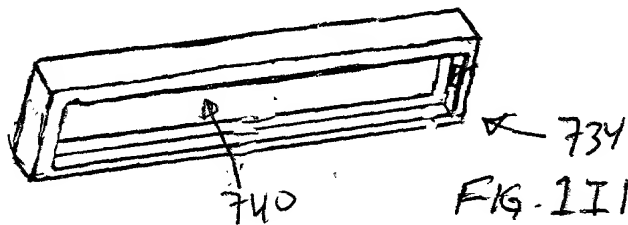


FIG. 1I19C

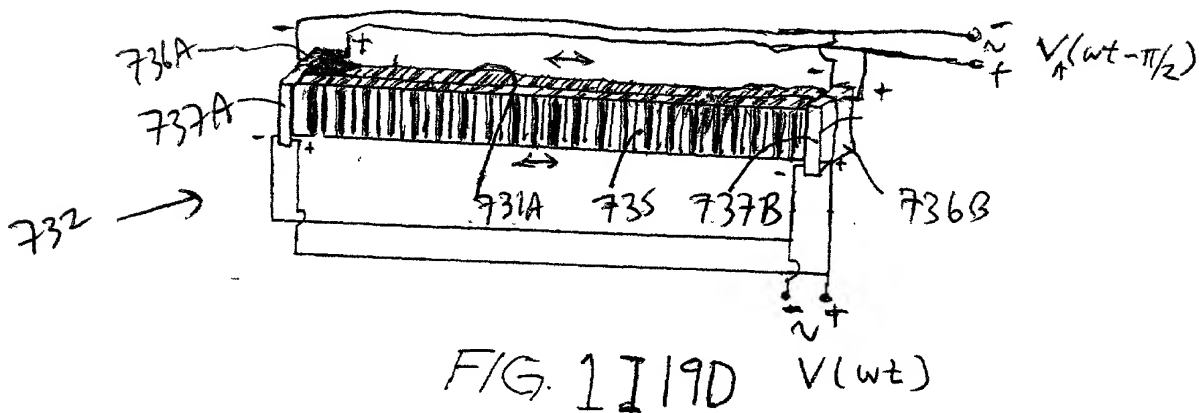


FIG. 1I19D

Fourth Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection array
of the IPD Subsystem
(SIMF)

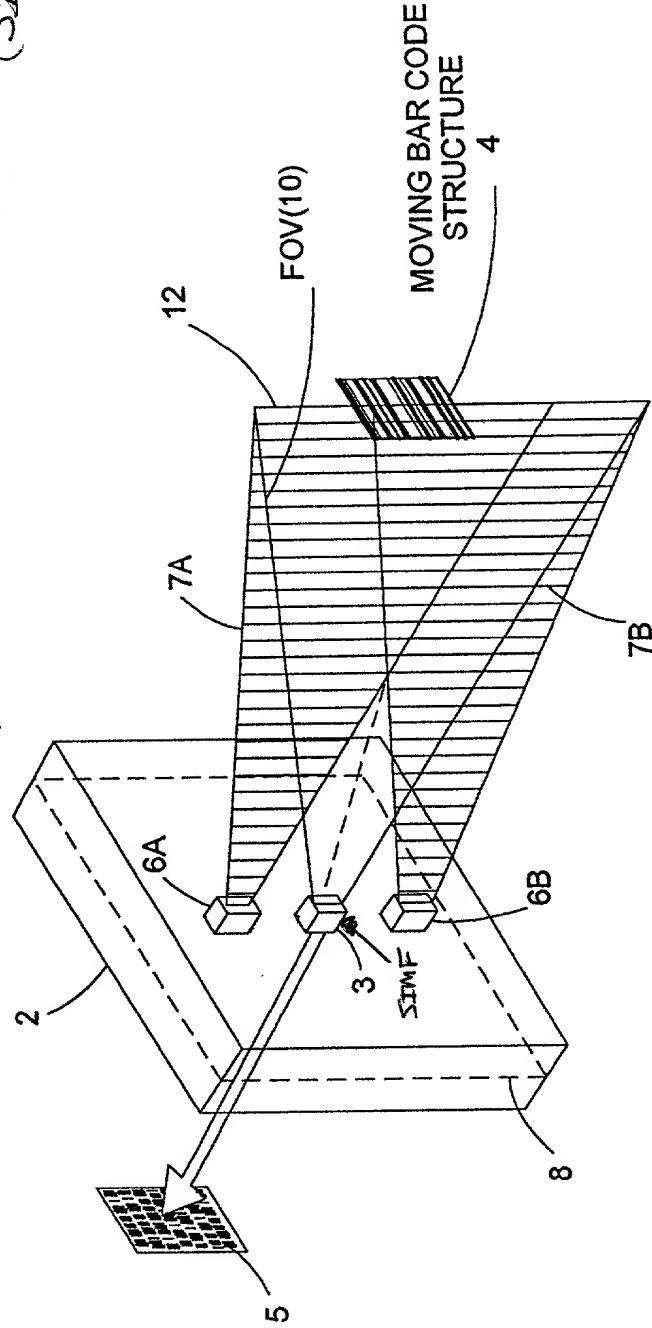


FIG. 1120

[illegible]

FIG. 1121A

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The ~~Fourth~~ Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to modulate the phase along the wavefront of the received PLIB and produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I21B

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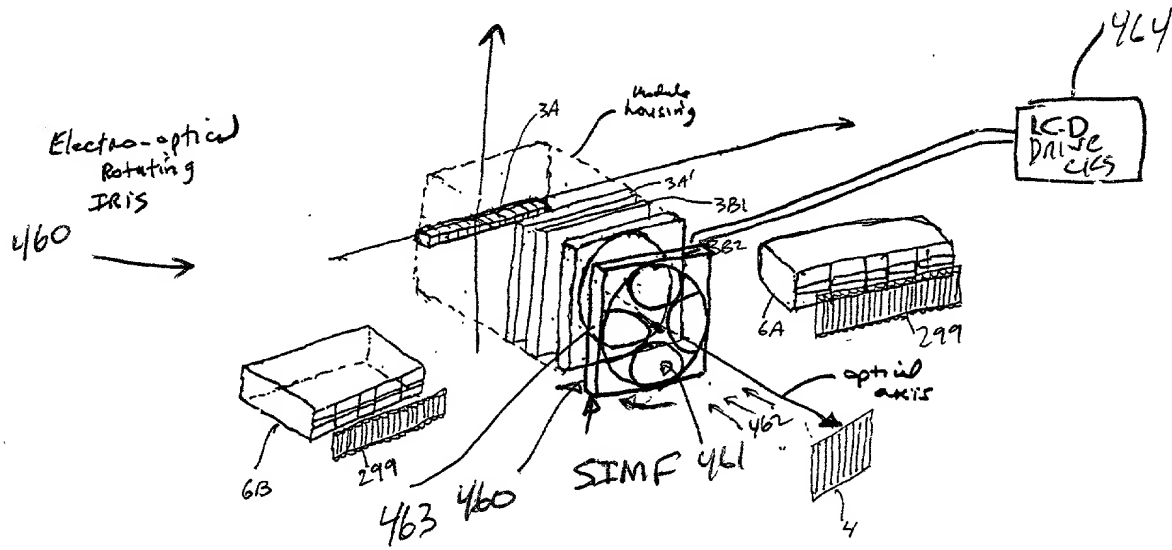


FIG. 1I 22A

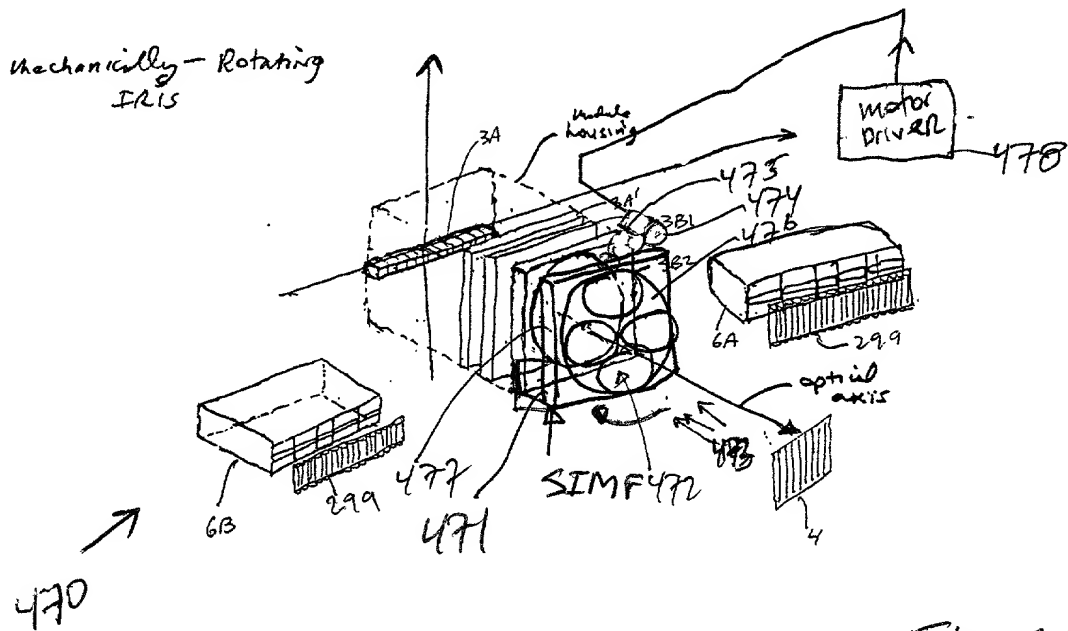


FIG. 1I 22B

FIG. 1I 22A

Fourth Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of the IFD Subsystem

(TIME)

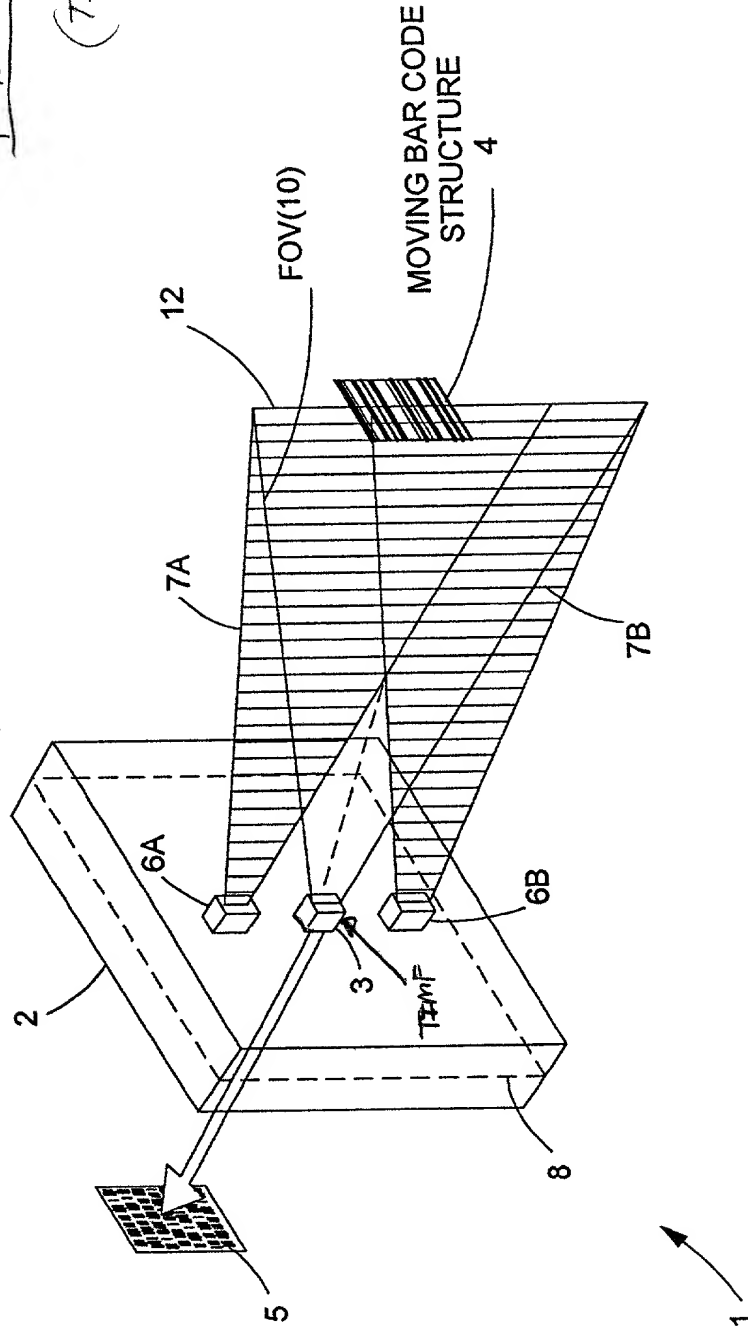


FIG. 1123

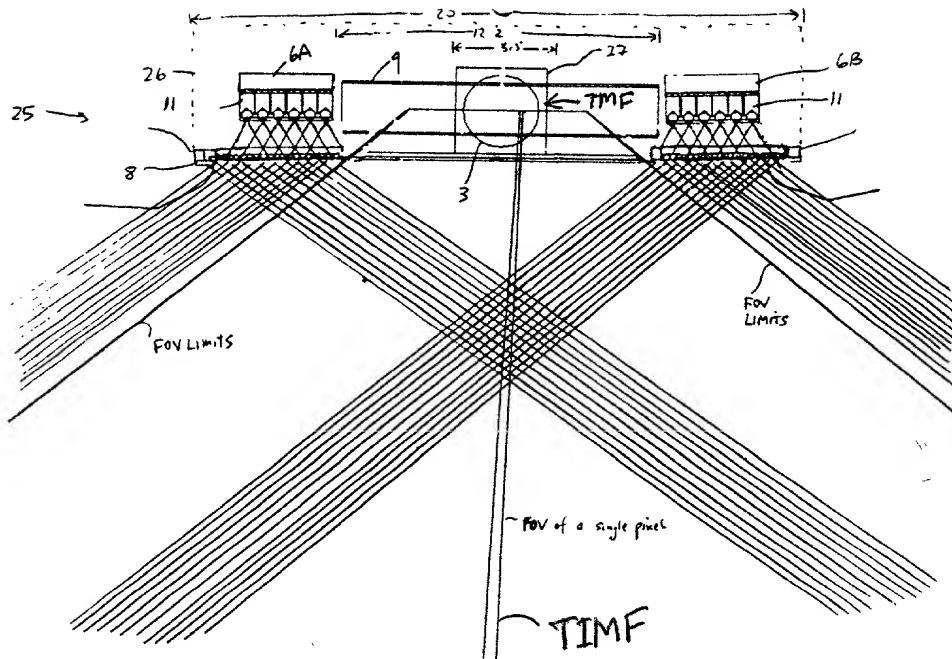


FIG. 1I 24A

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The Fifth Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to modulate the phase along the wavefront of the received PLIB and produce many substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I 24B

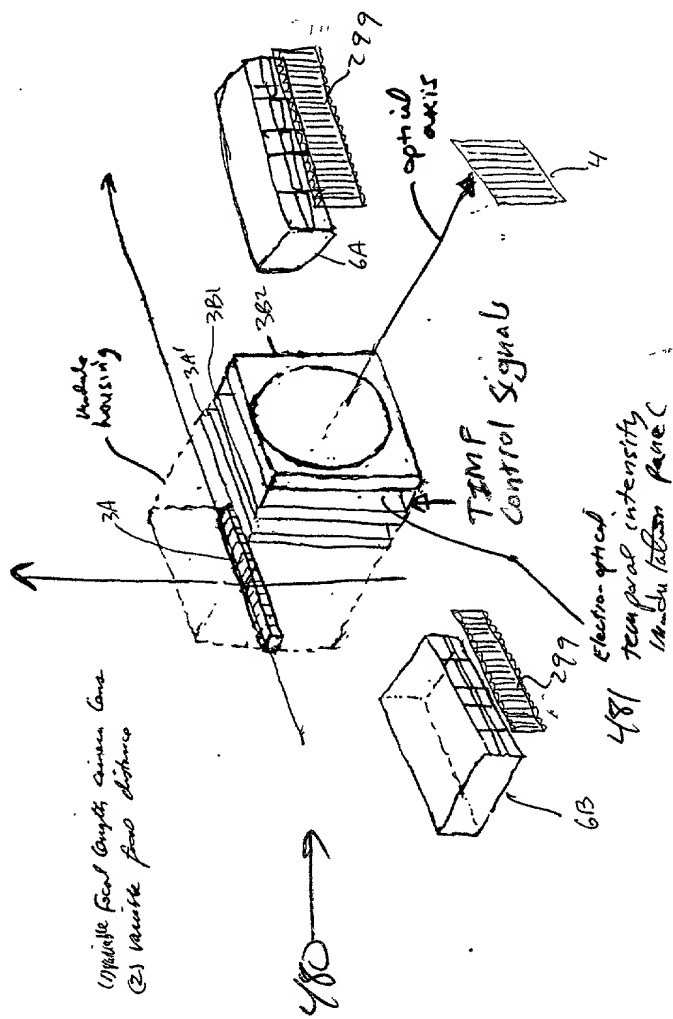


FIG. 1I 25

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Fixed focal length lens cases

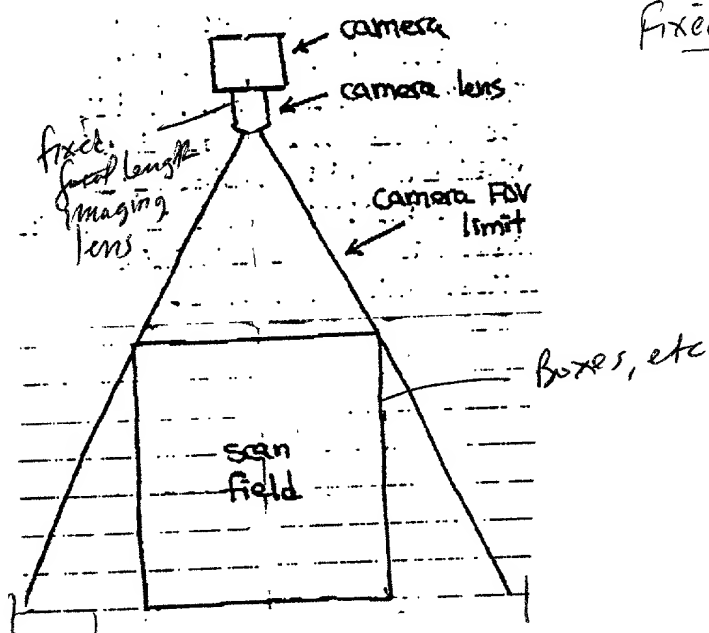
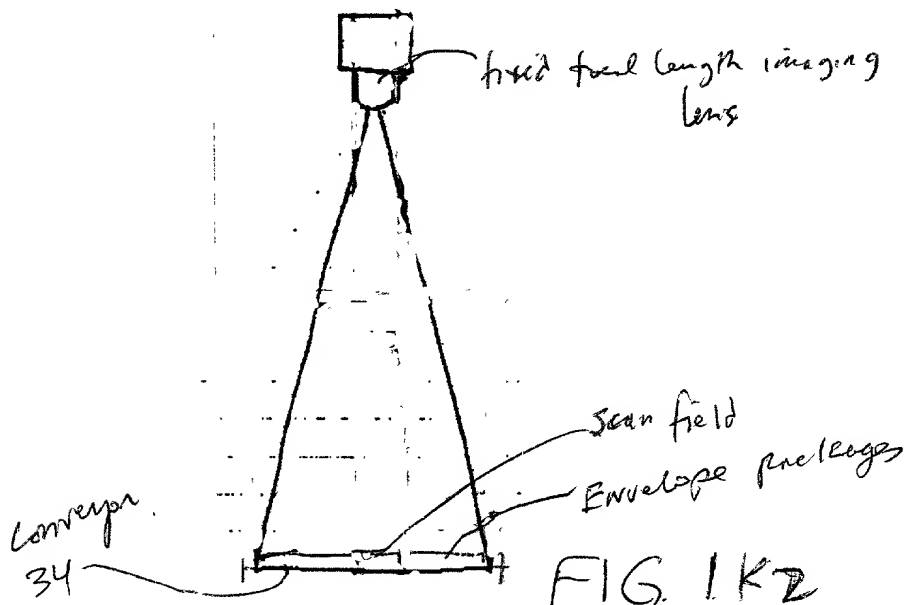


FIG. 1K1
conveyor 34



conveyor
34

FIG. 1K2

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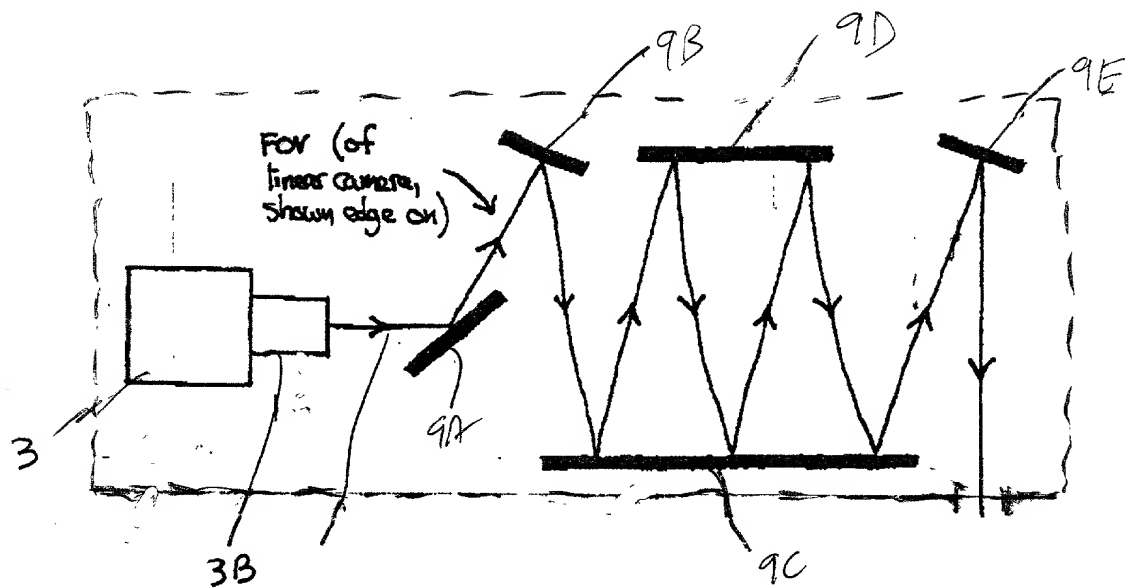


FIG. 1L1

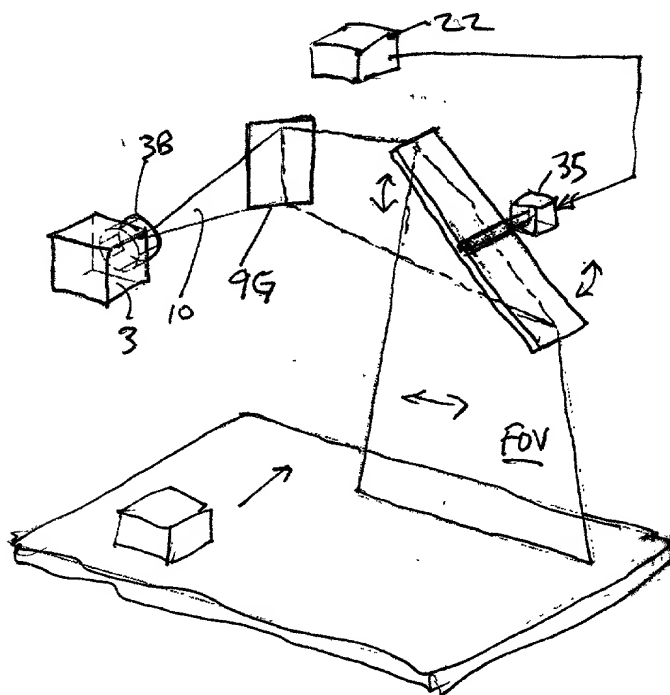


FIG. 1L2

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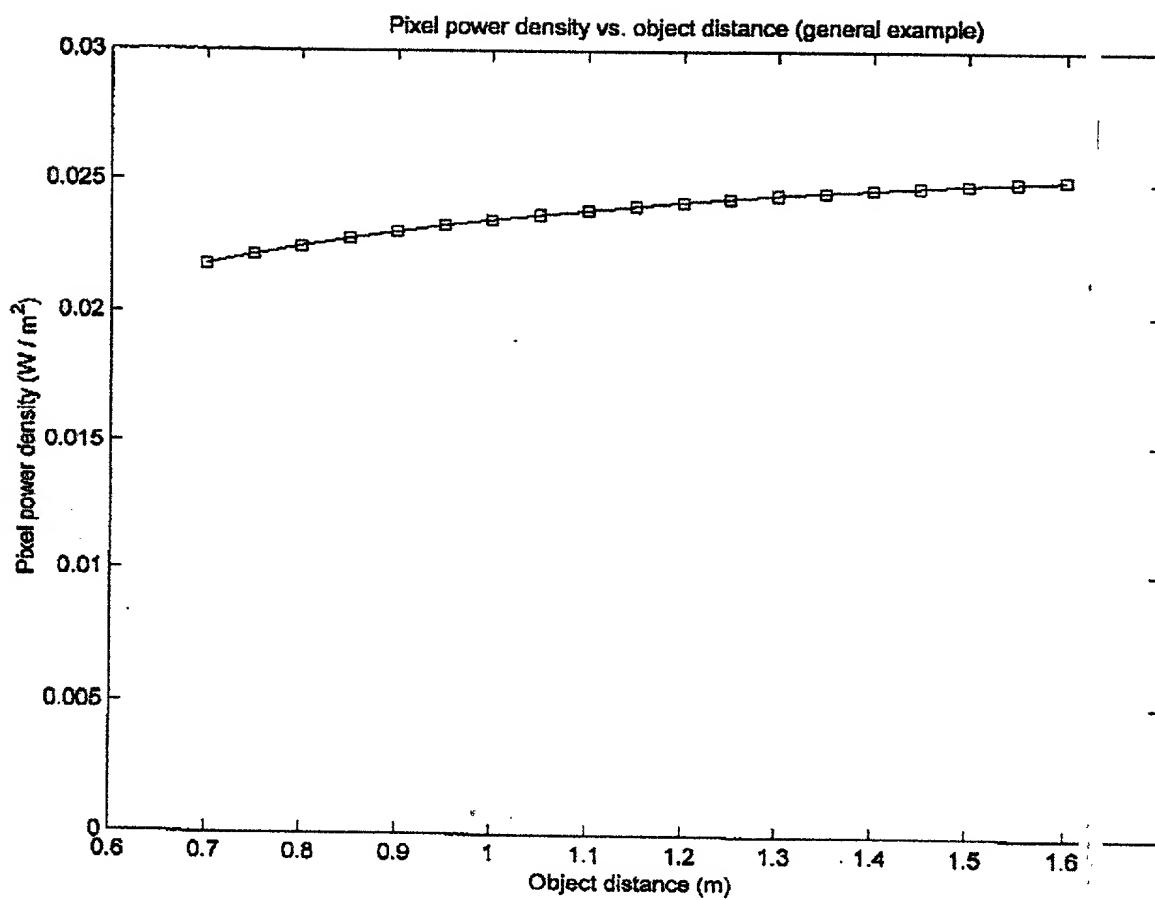


FIG-1M1

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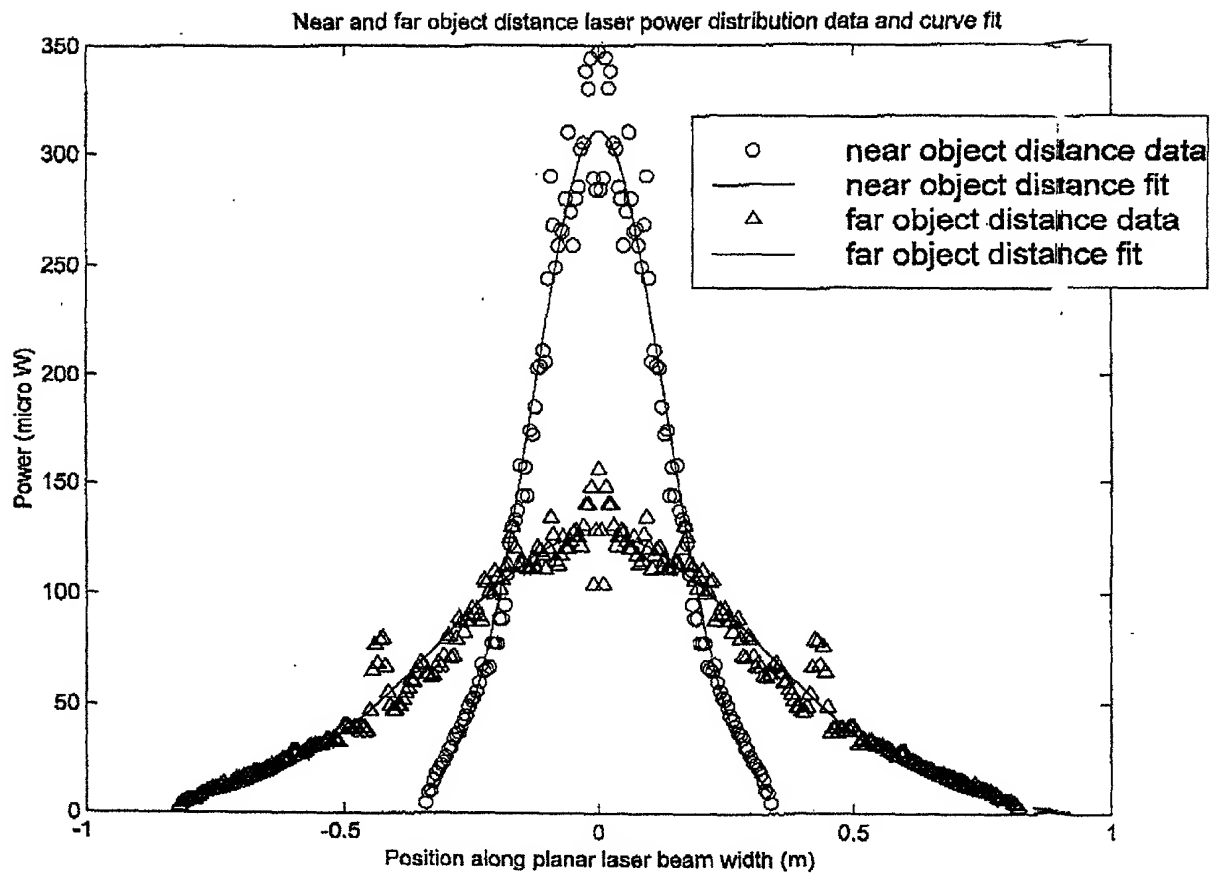


FIG. 1M2

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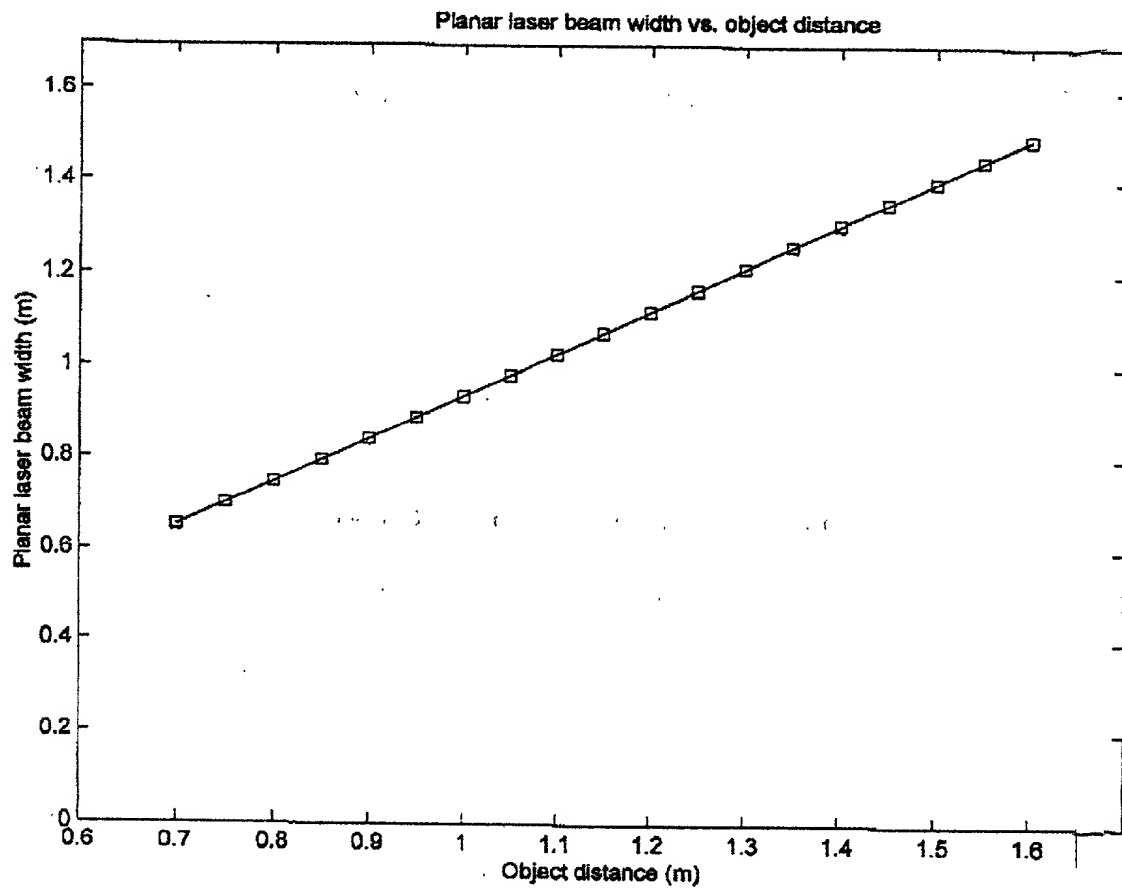


FIG. 1M3

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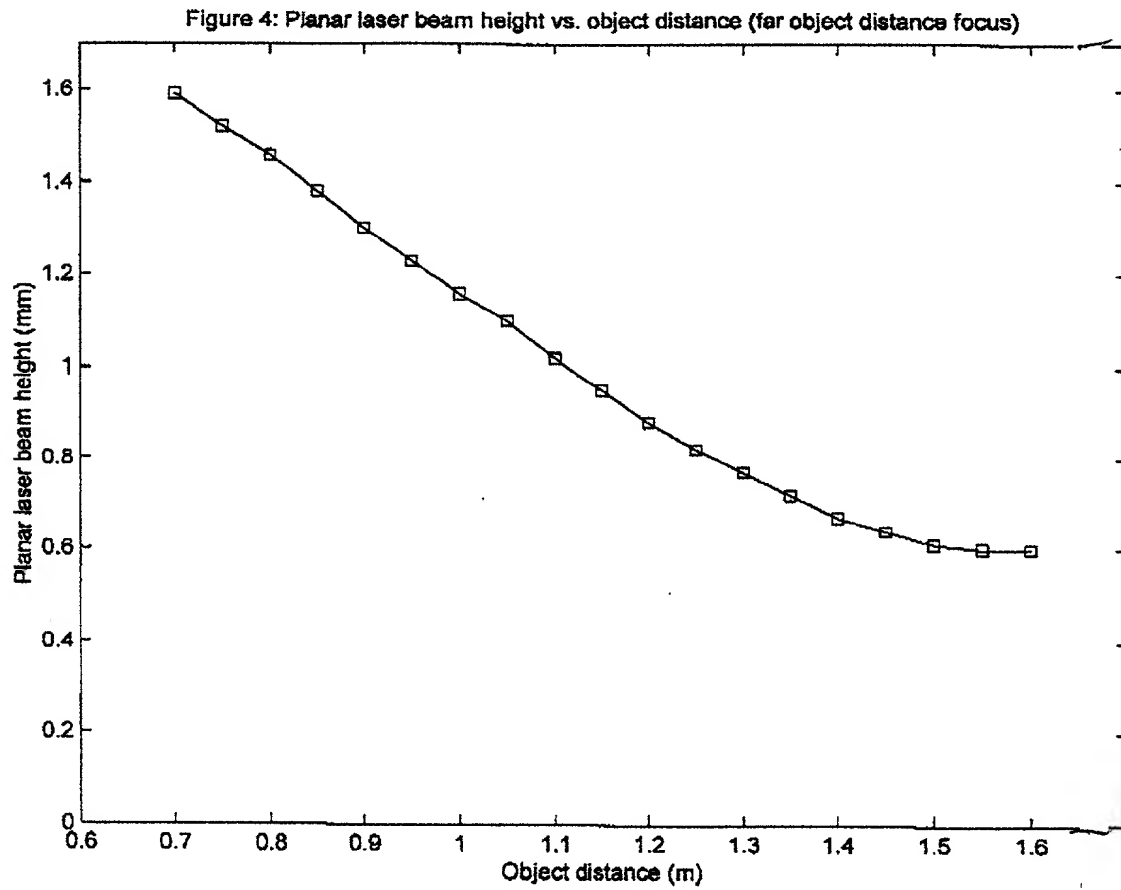


FIG 1M4

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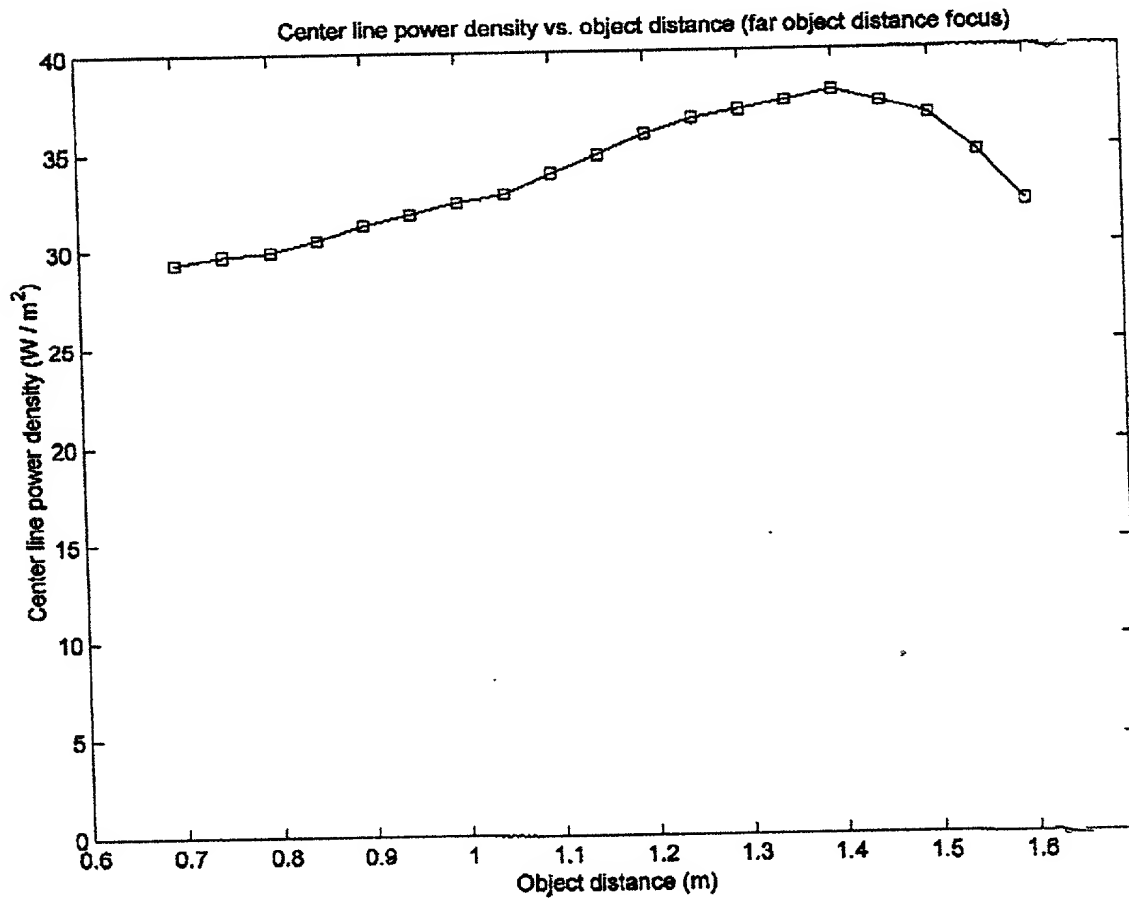


FIG. 1N

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Figure 6: Pixel power densities vs. object distance

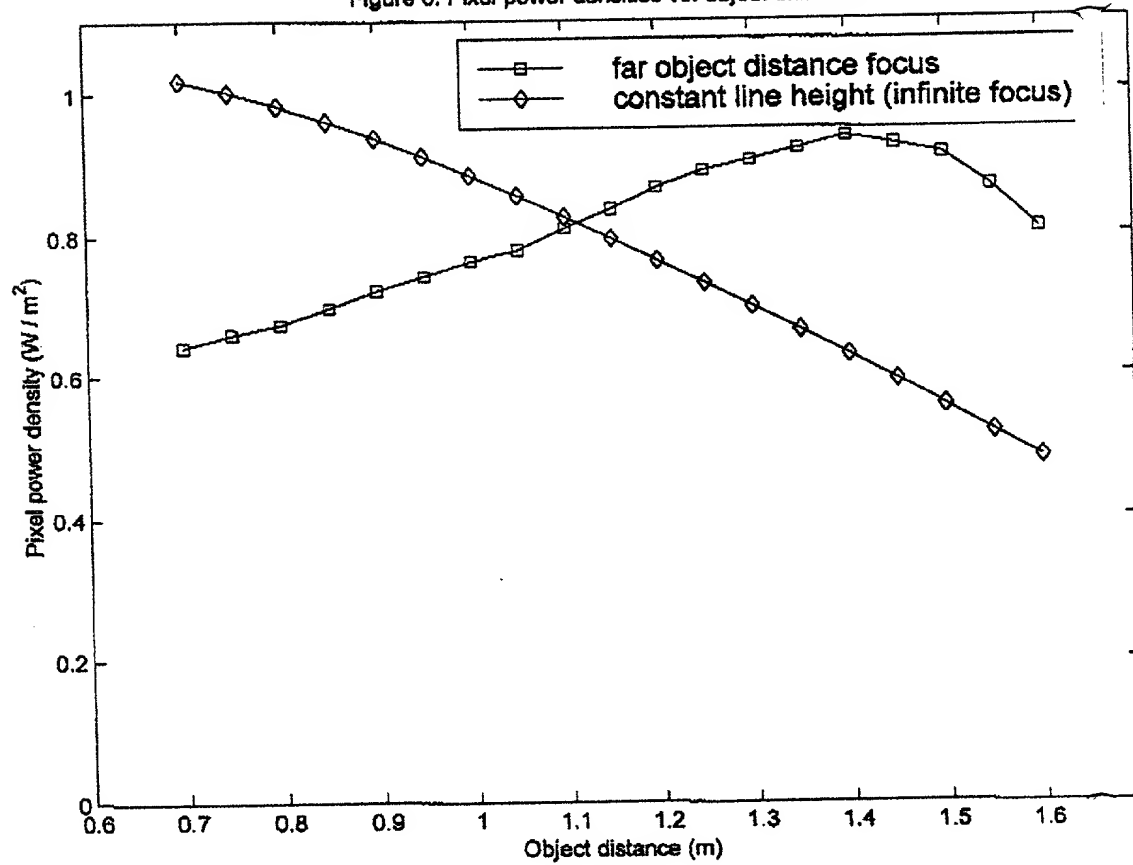


FIG. 10

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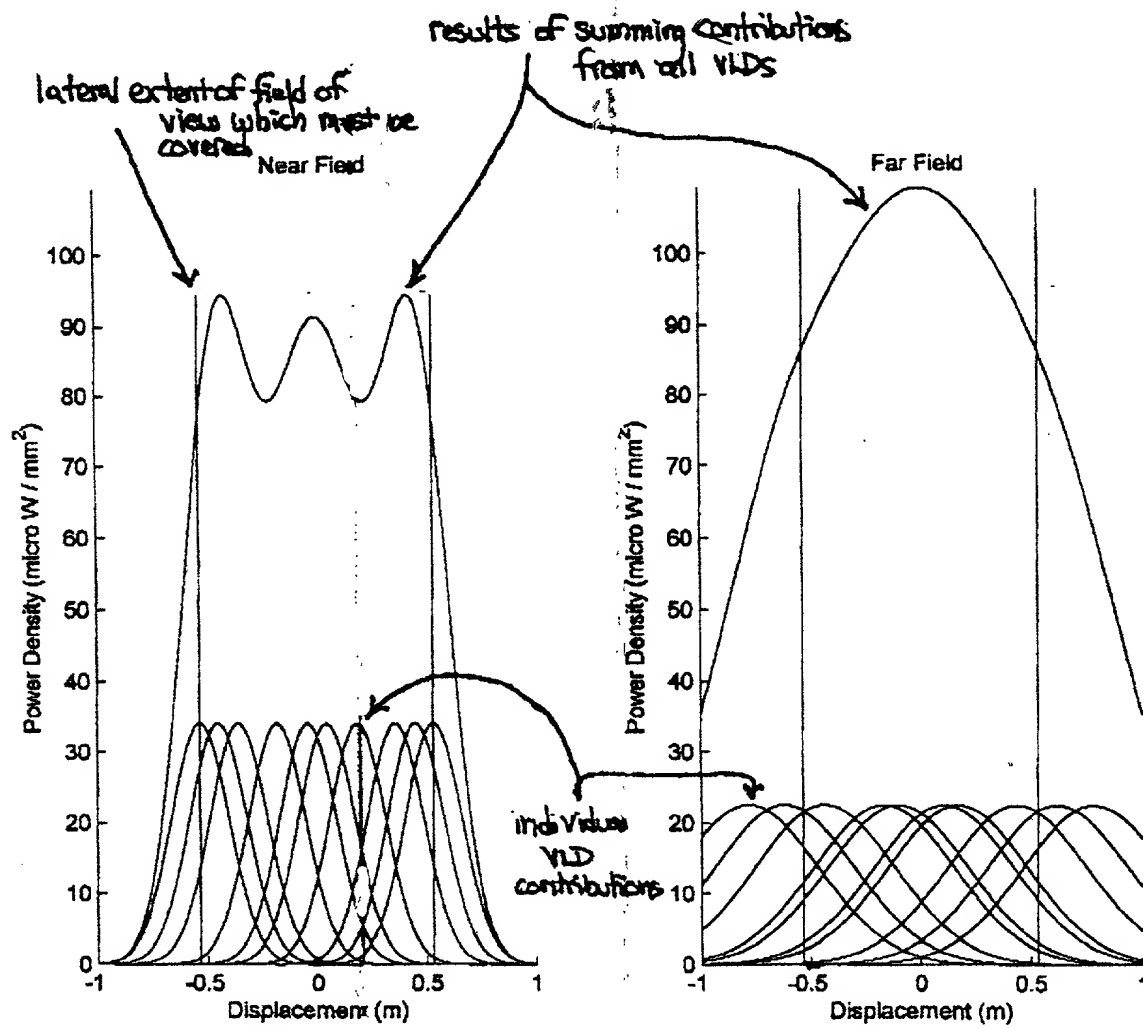


FIG. 1P1

FIG. 1P2

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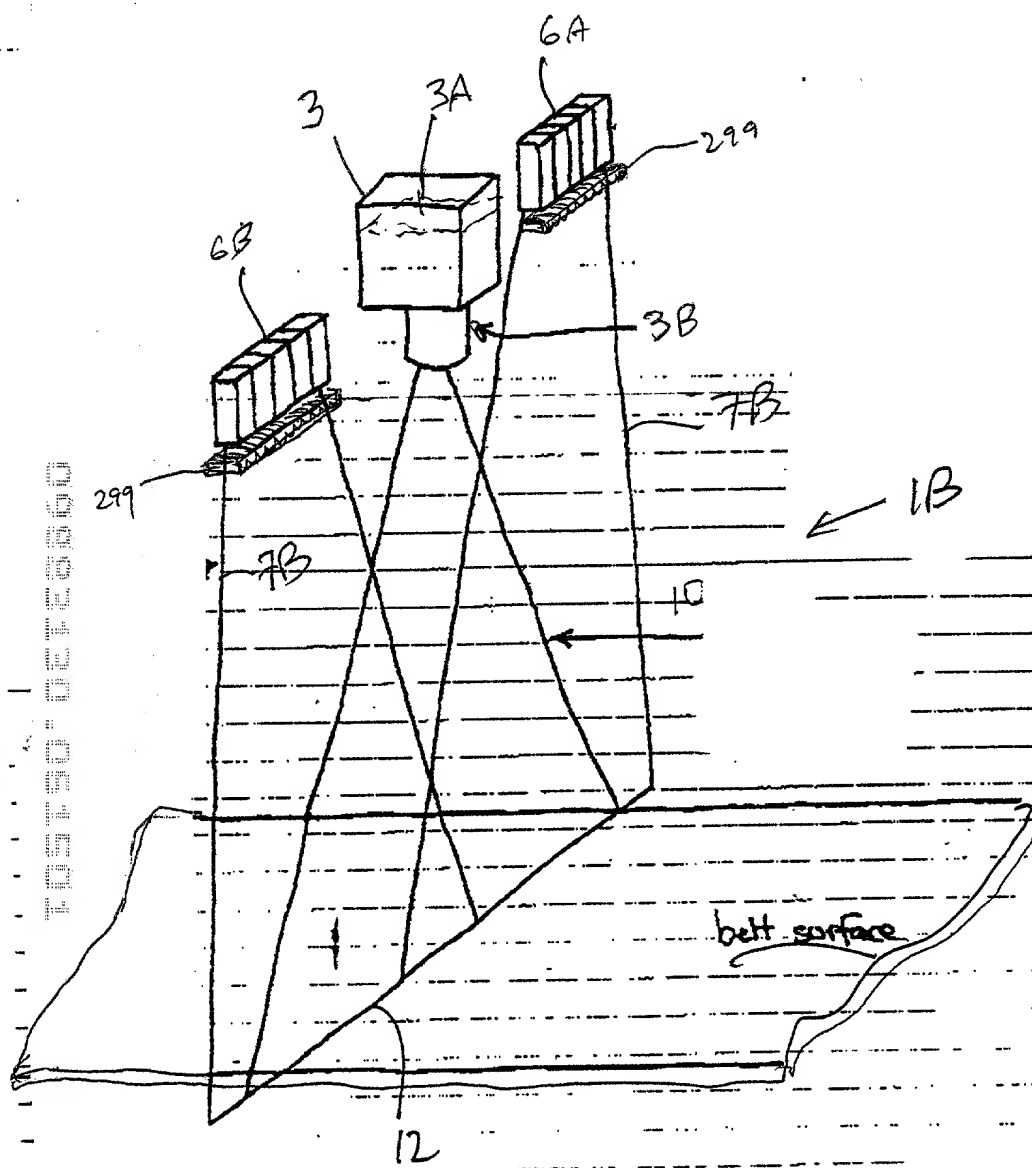


FIG. 1Q1

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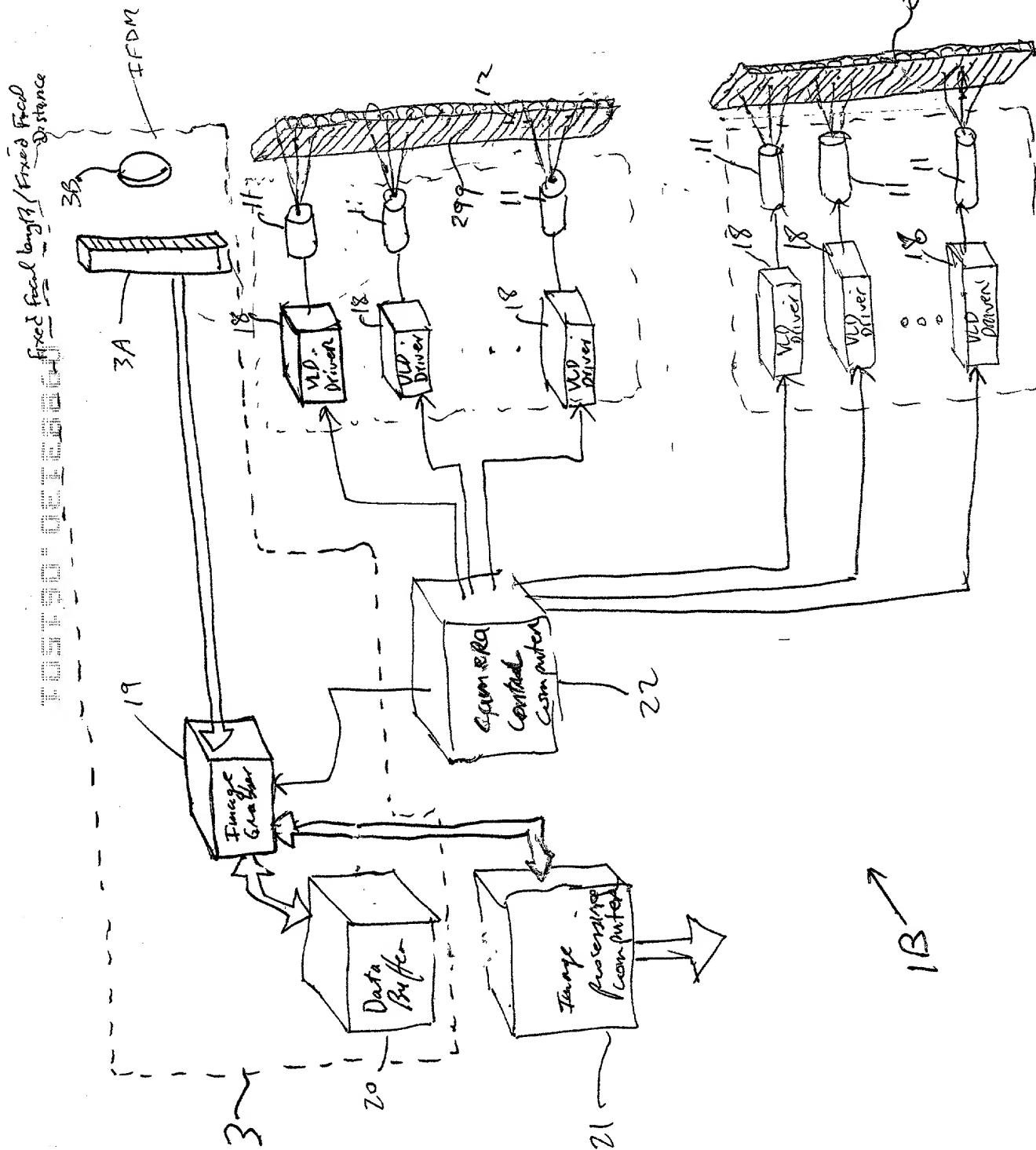


FIG. 102

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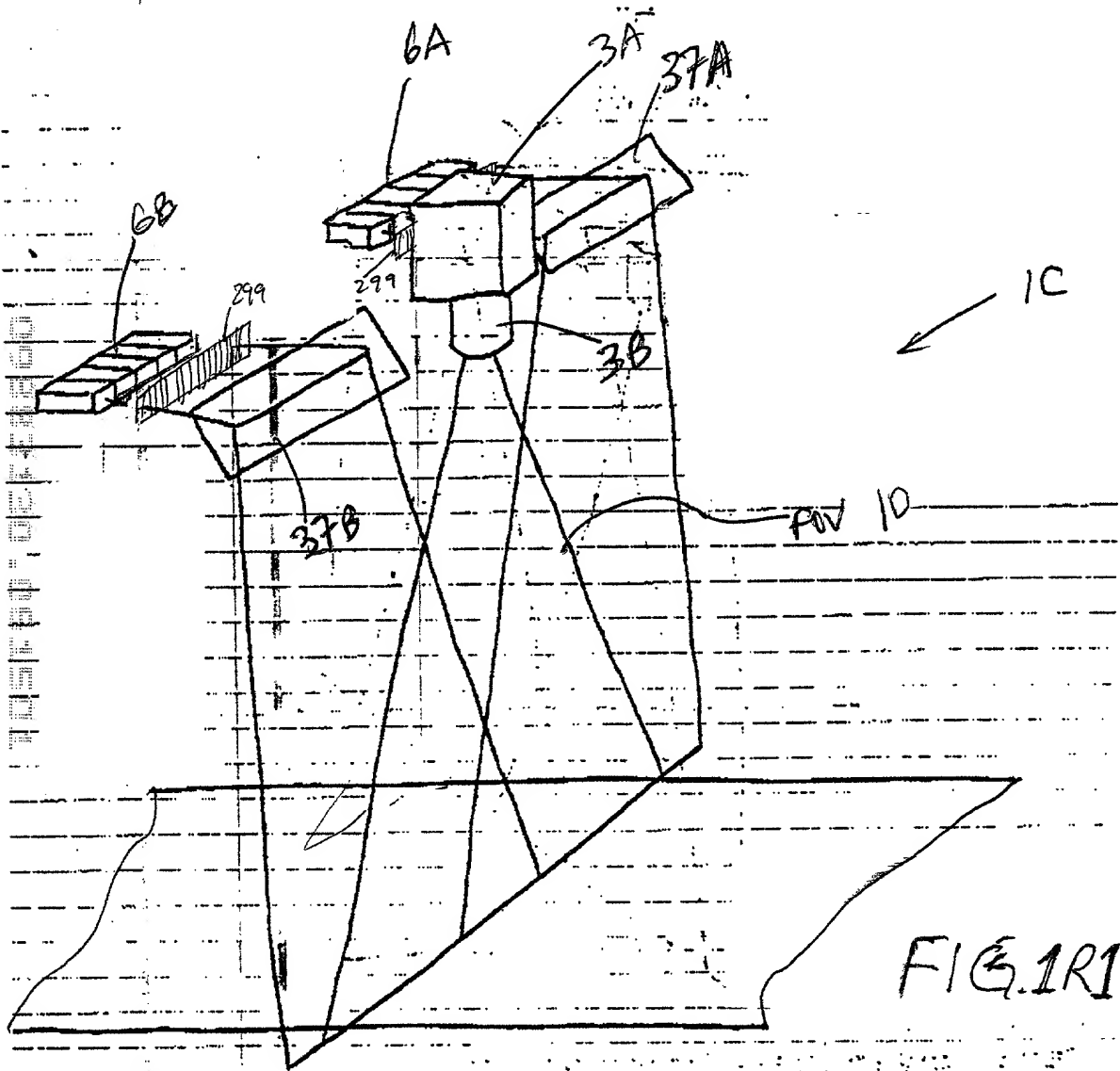


FIG. 1R1

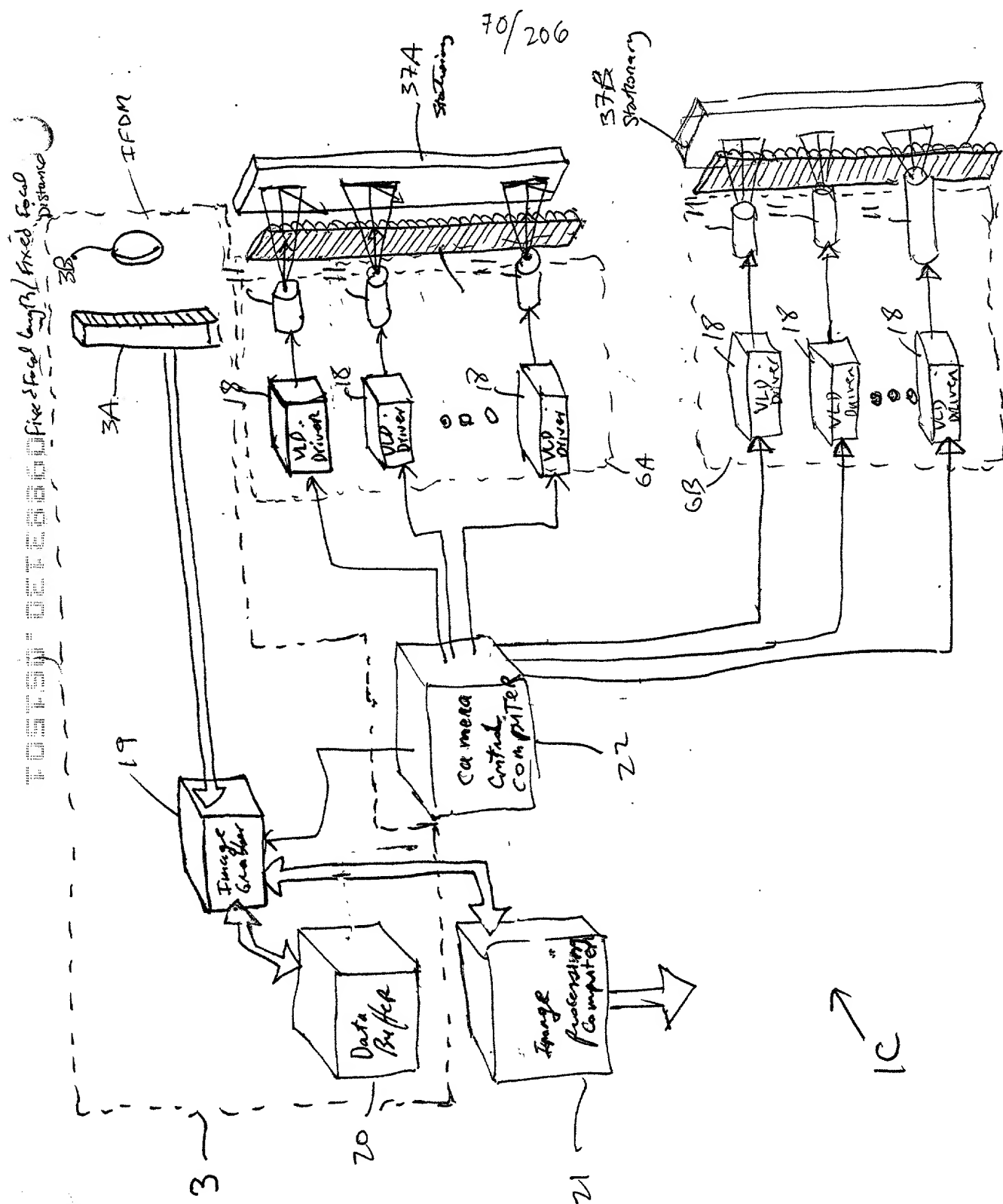


FIG. 1R2

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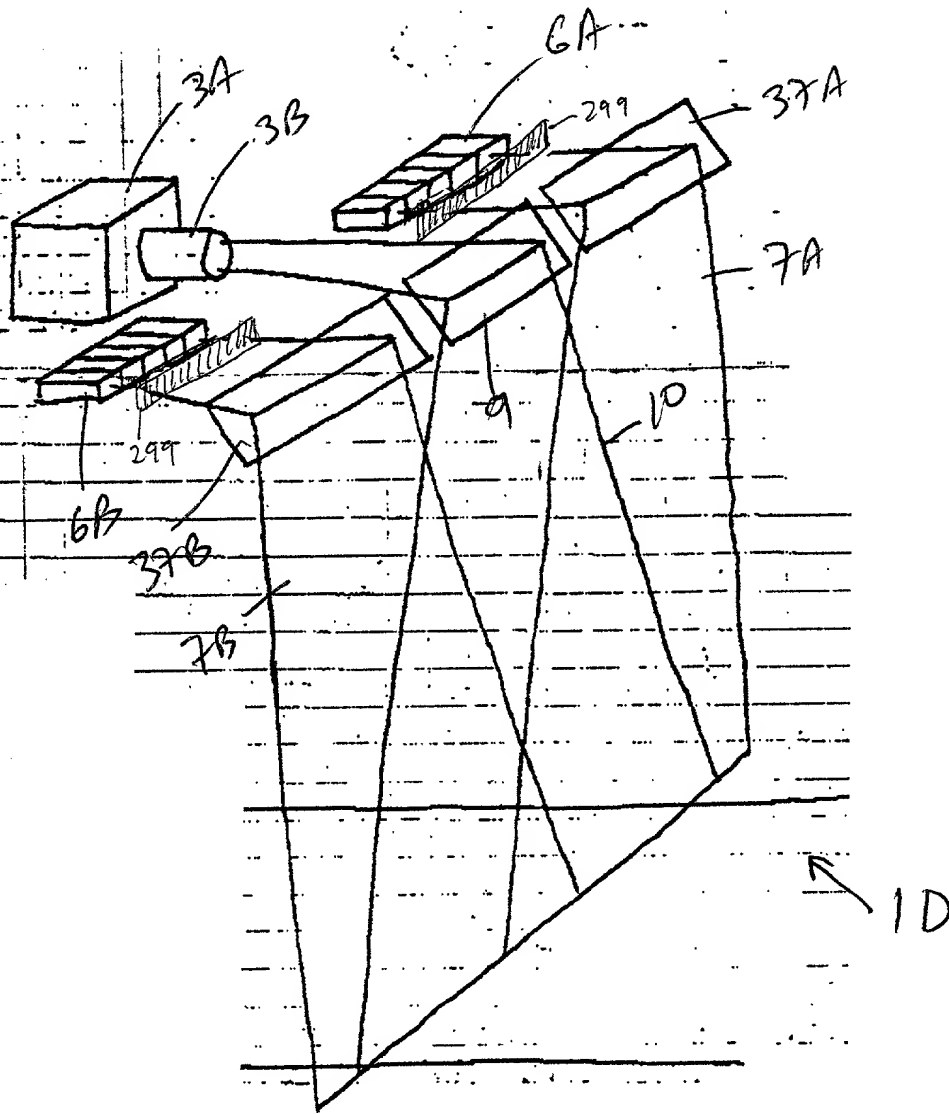
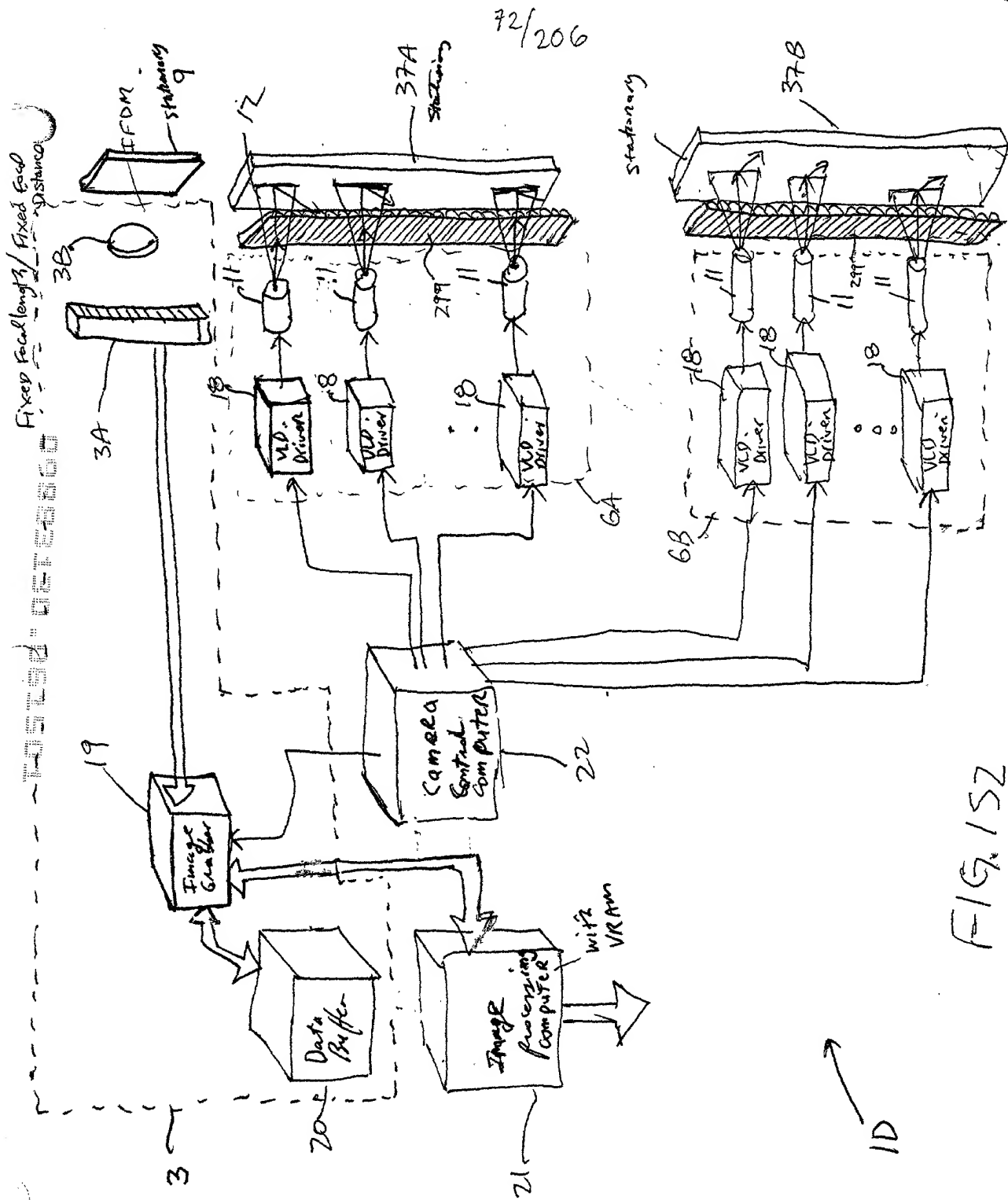
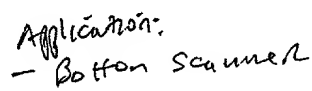


FIG. 1S1



[illegible]

HG IT

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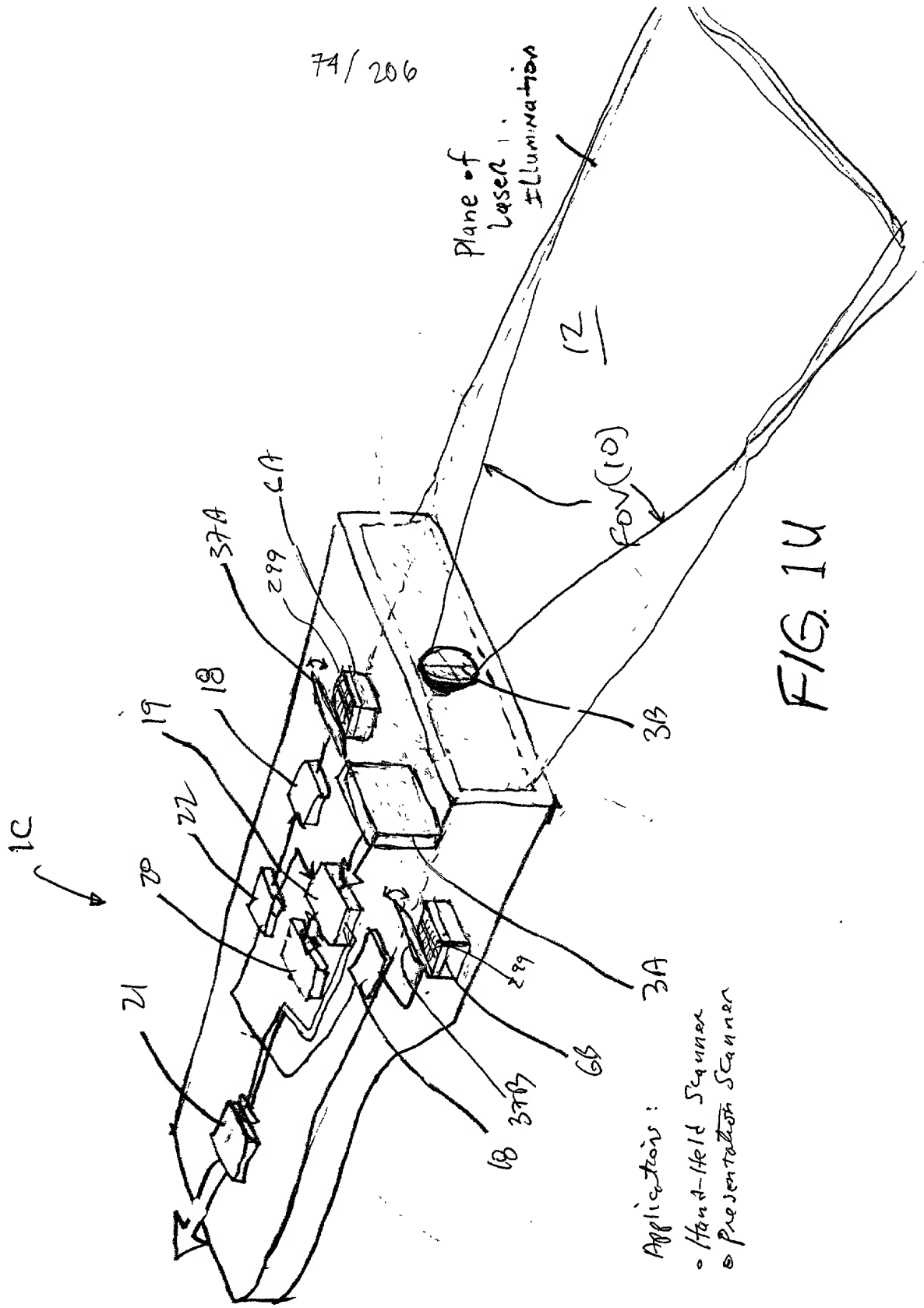


FIG. 1U

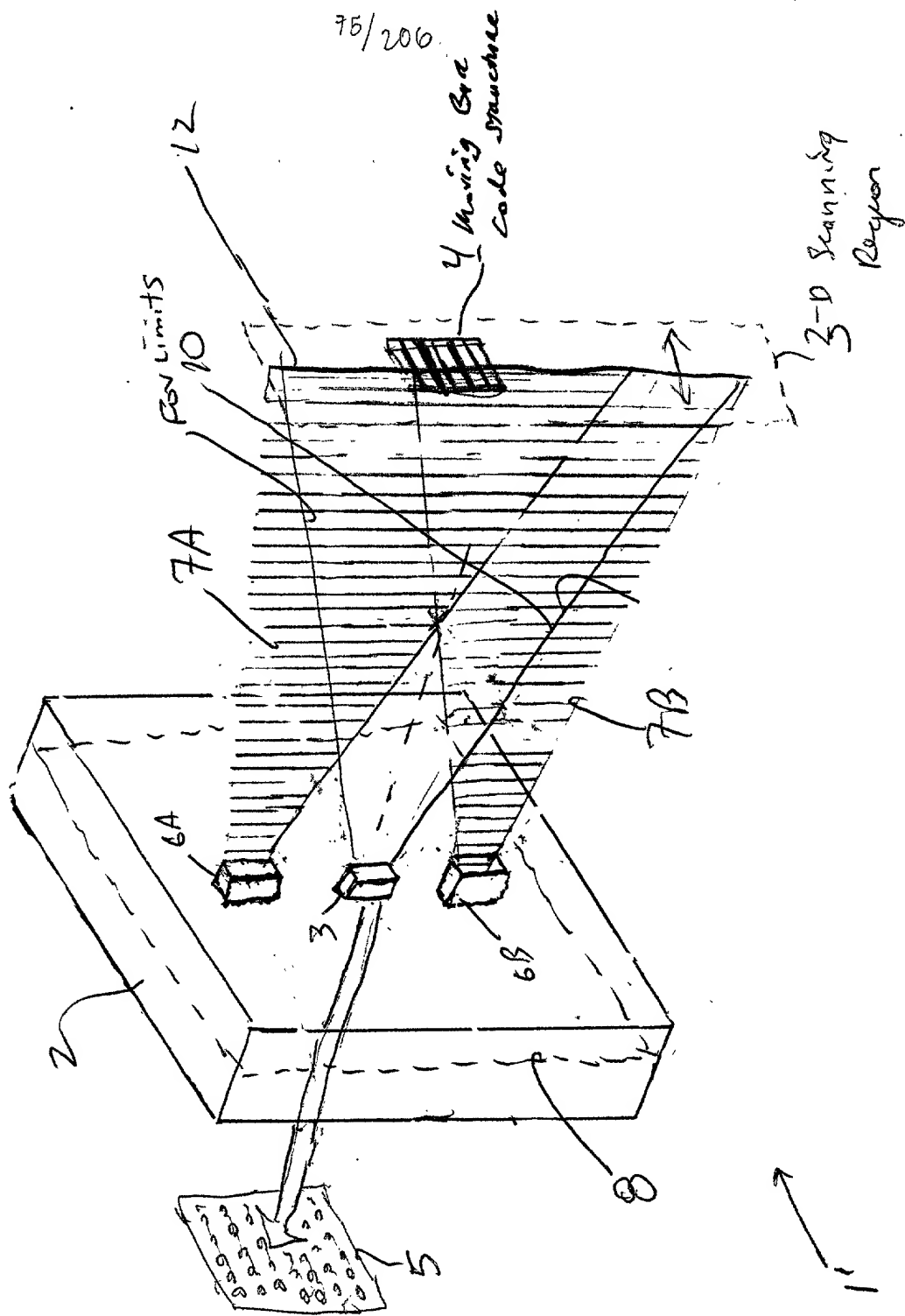


FIG. IVI

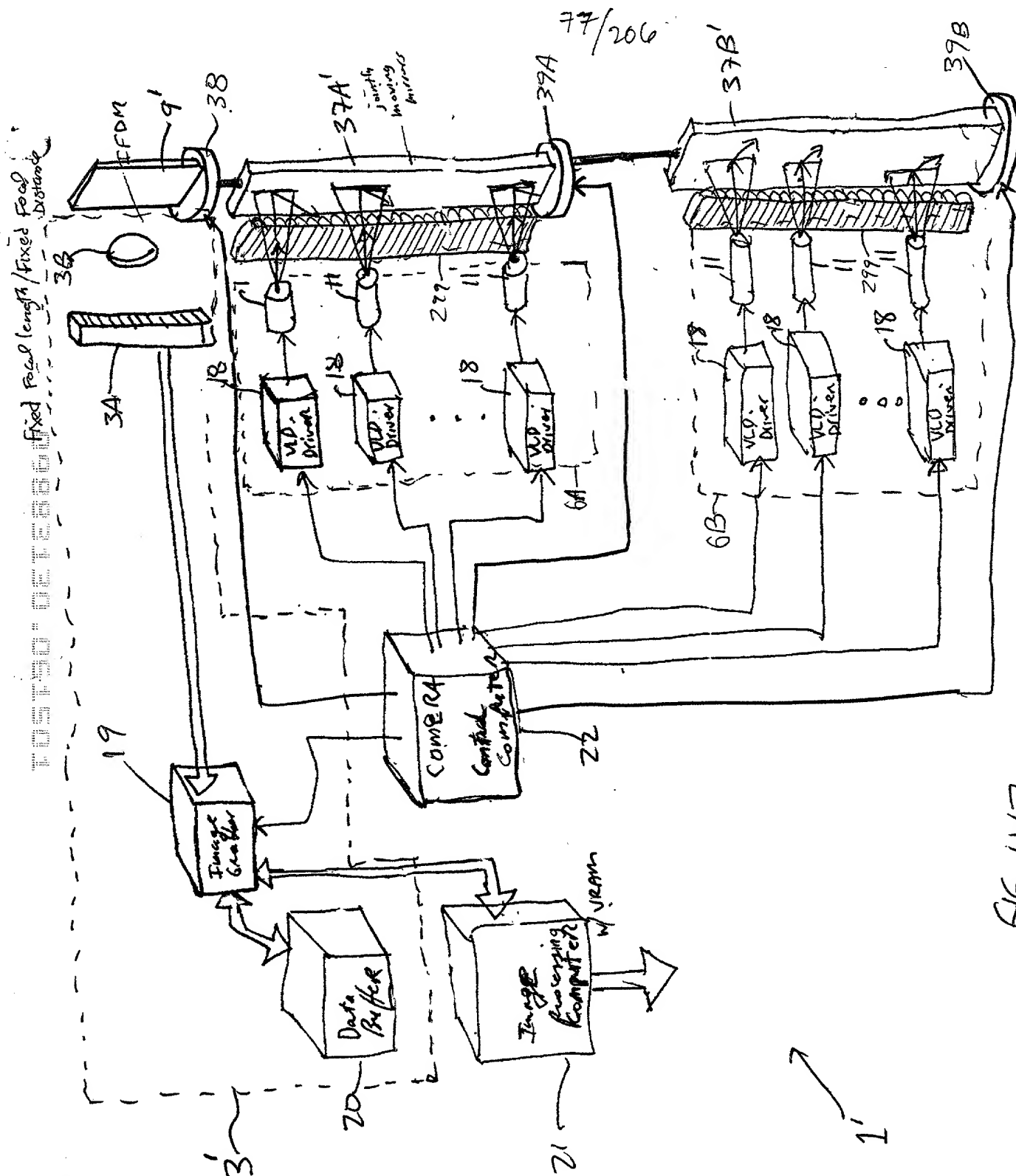


FIG. 1V3

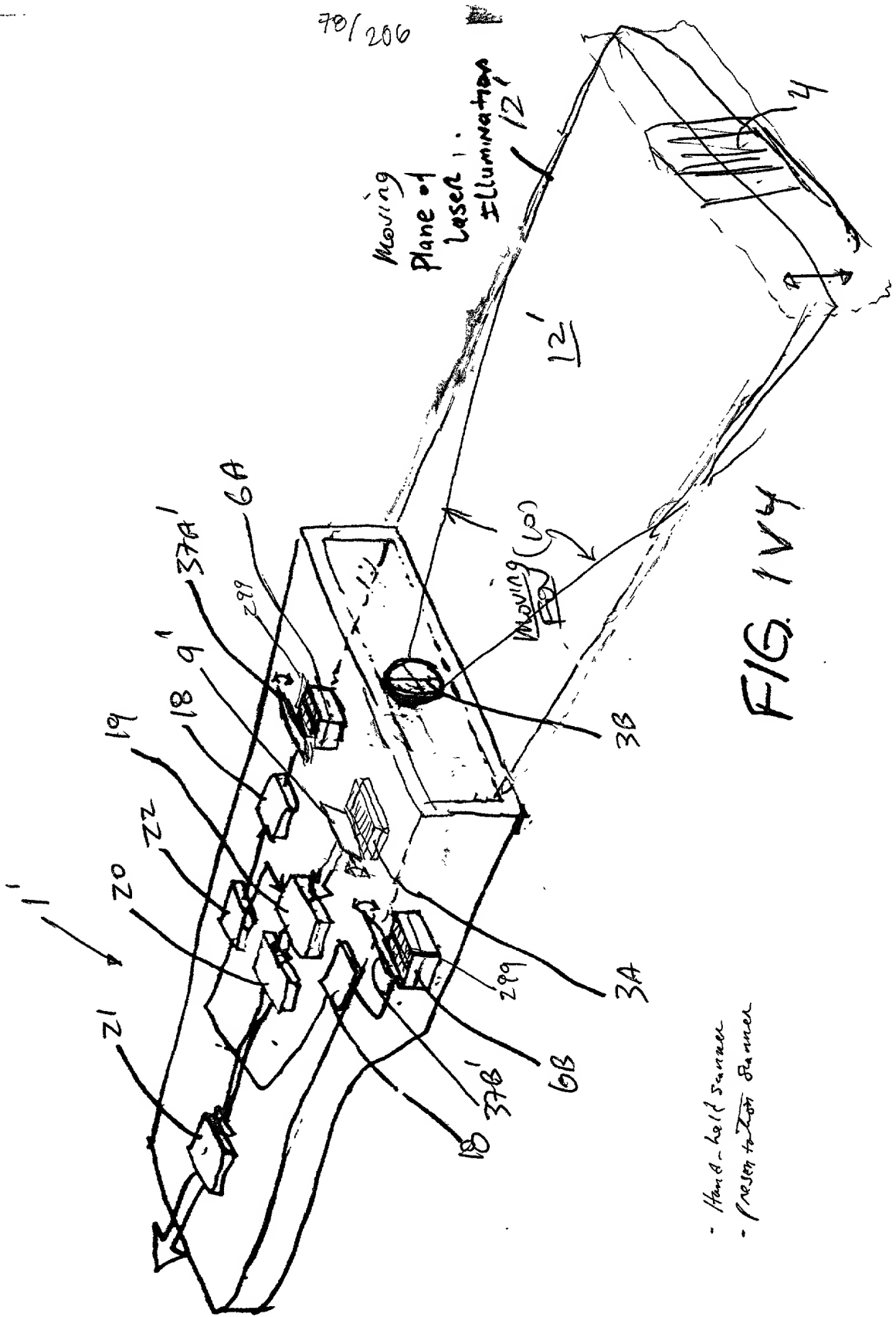
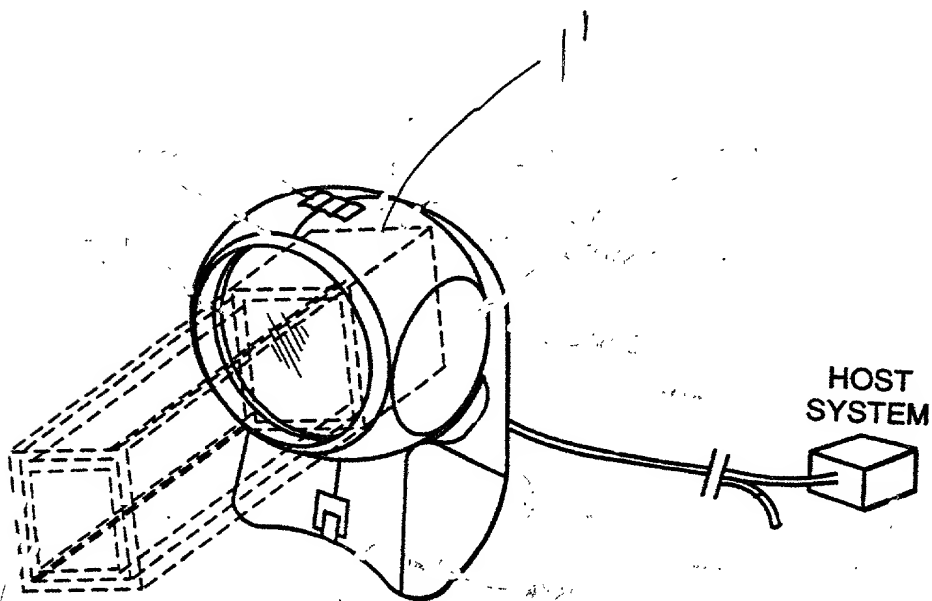


FIG. 1V4

- Hand-held Scanner
- Presentation Scanner

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(Presentation type scanner)

FIG. 1 V5

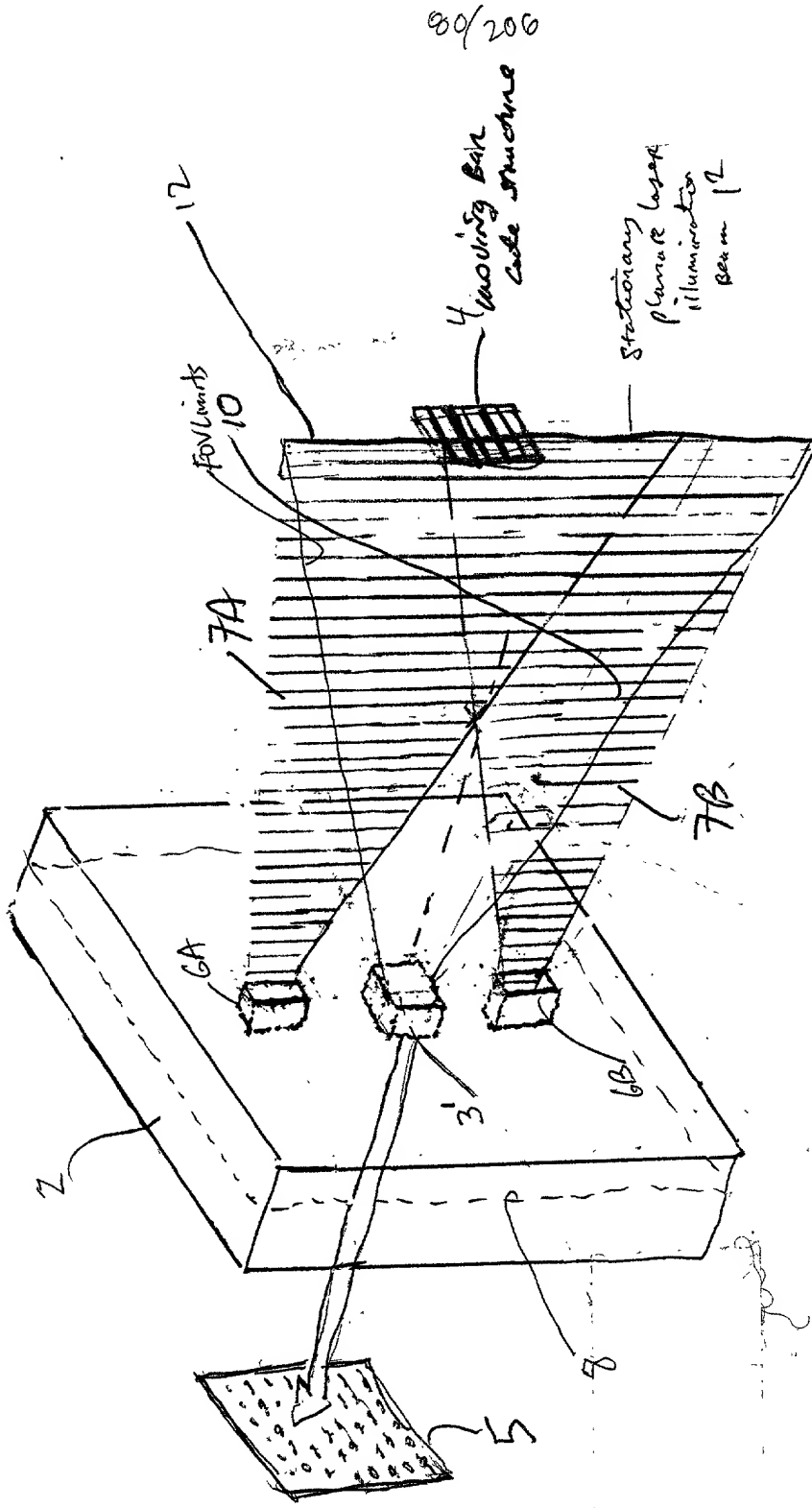


FIG. 2A

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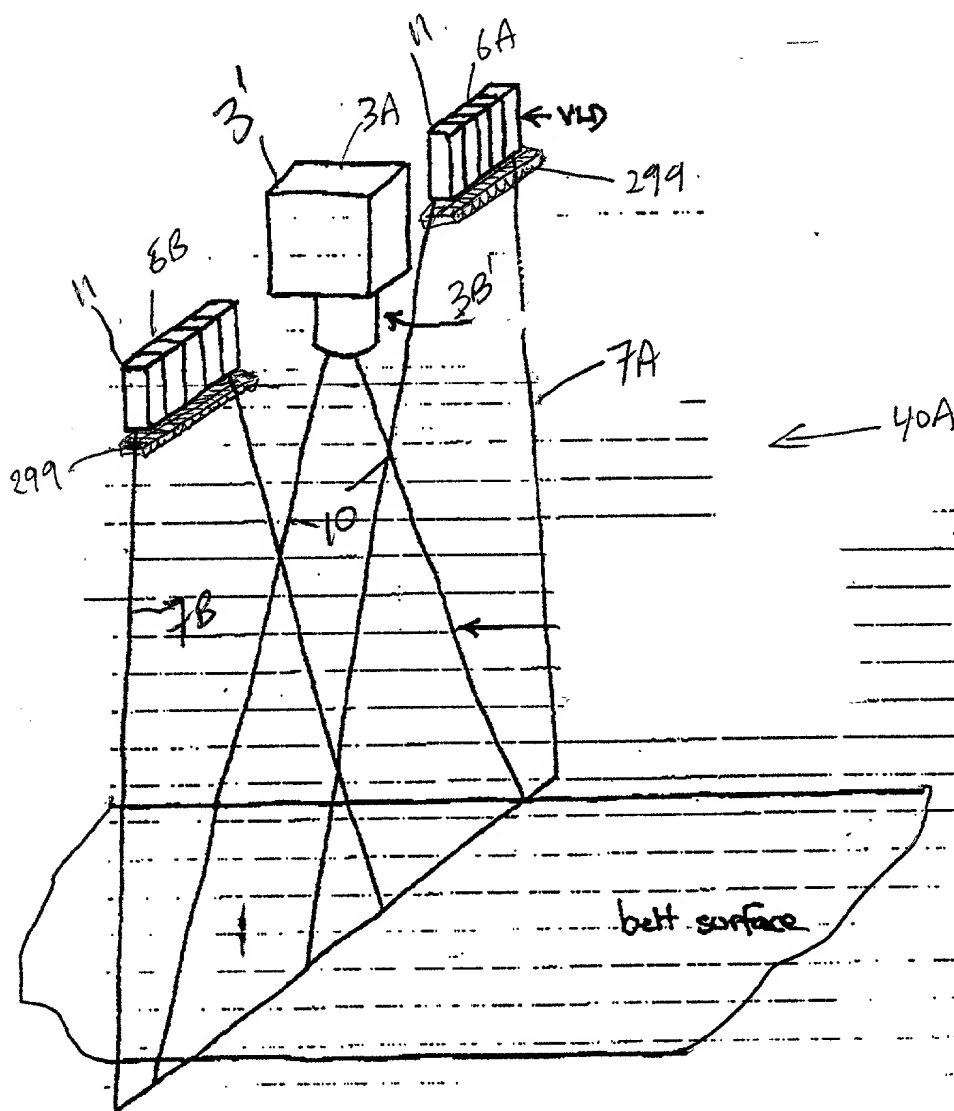


FIG. 2 B1

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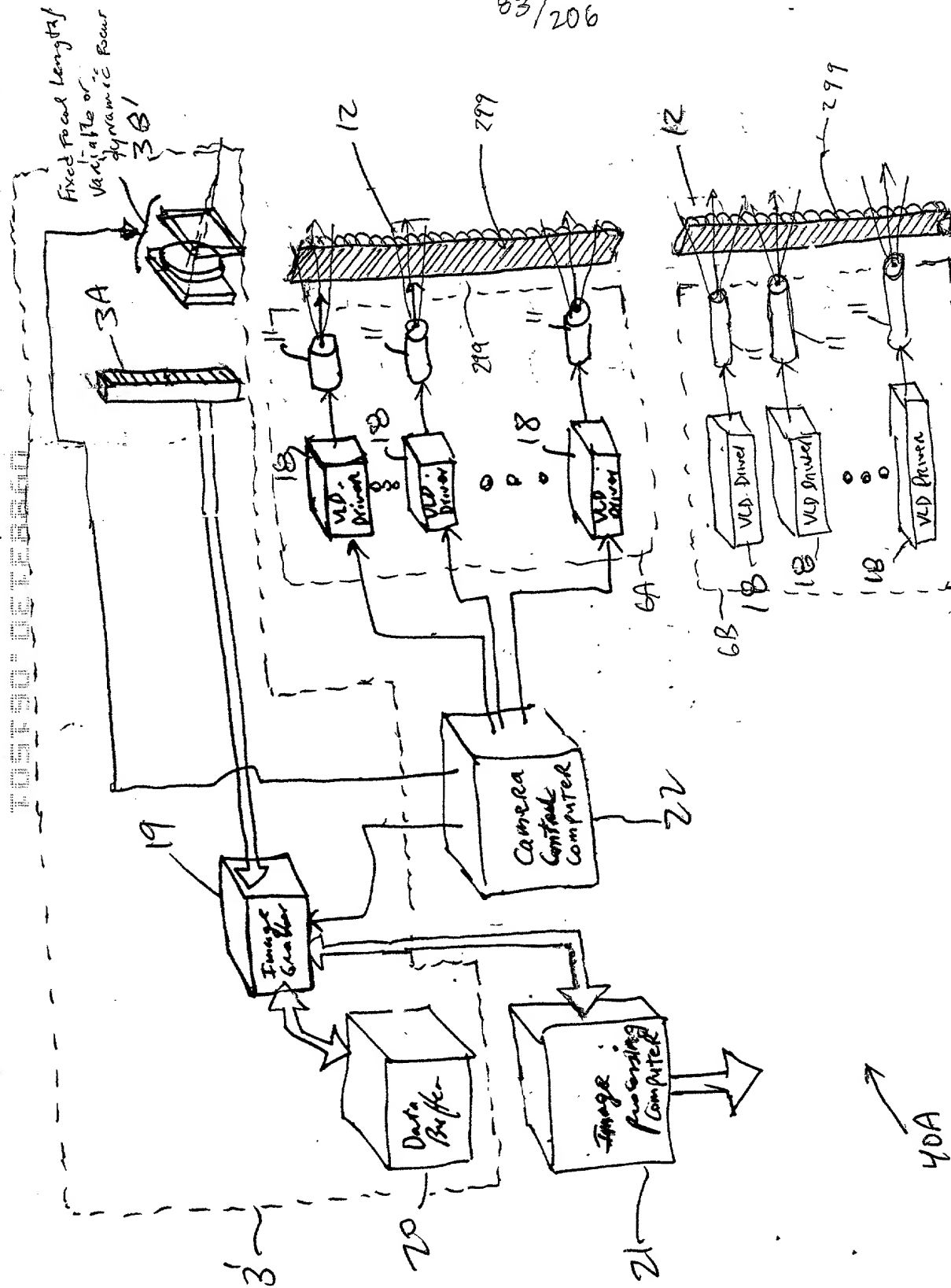


FIG. 2C1

40A

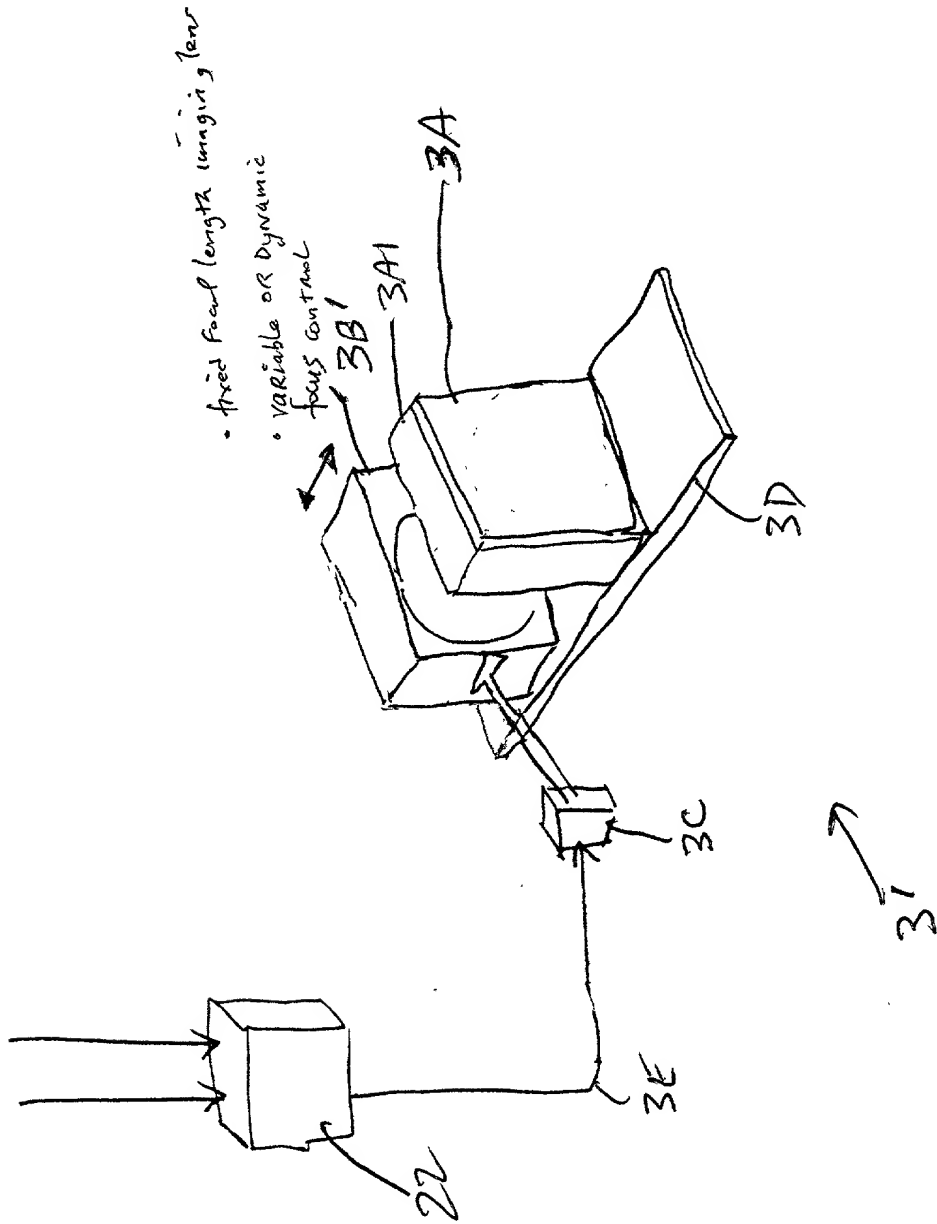
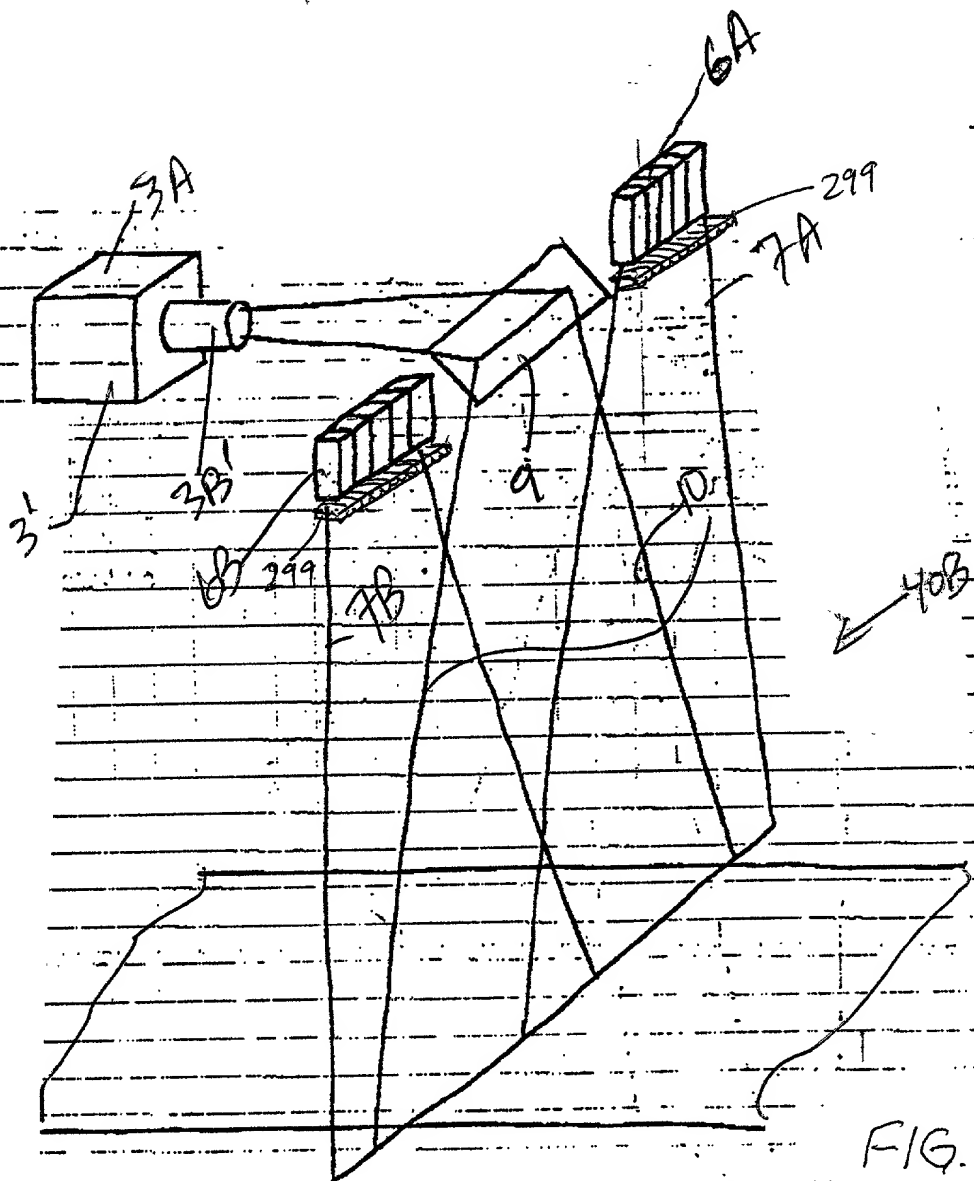


FIG. 2C2

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105150"02142800

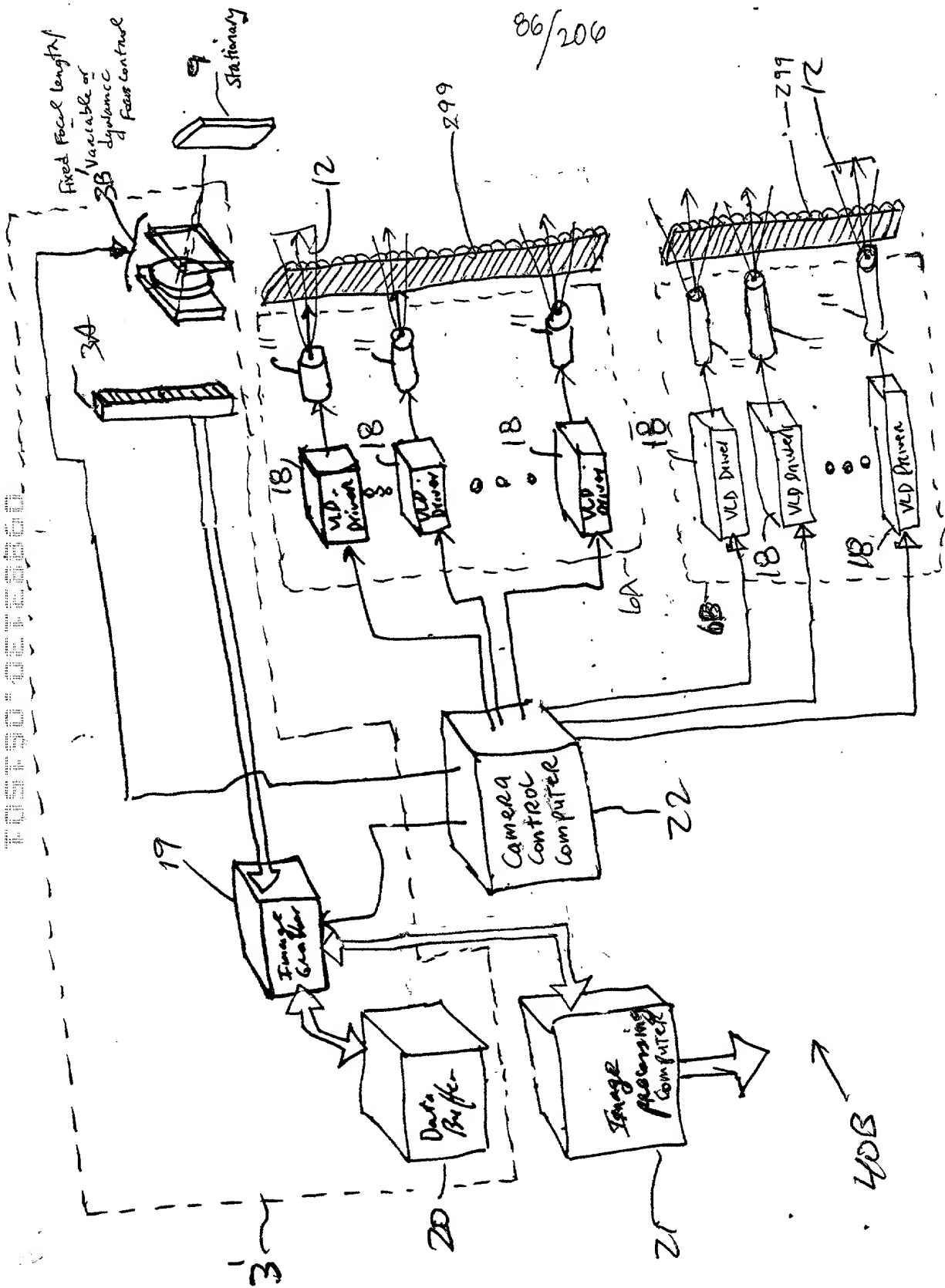


FIG. 2D2

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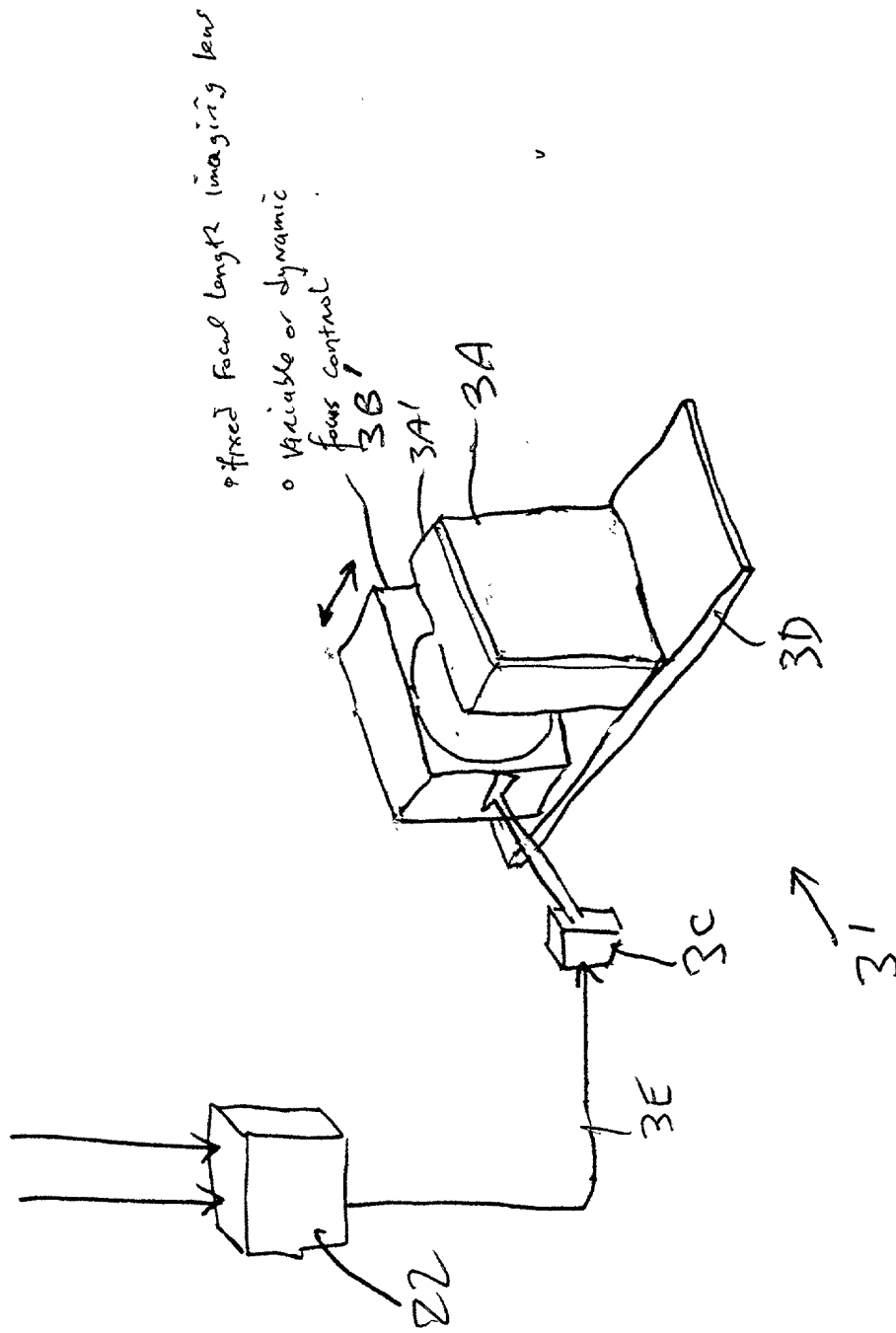


FIG. 2D3

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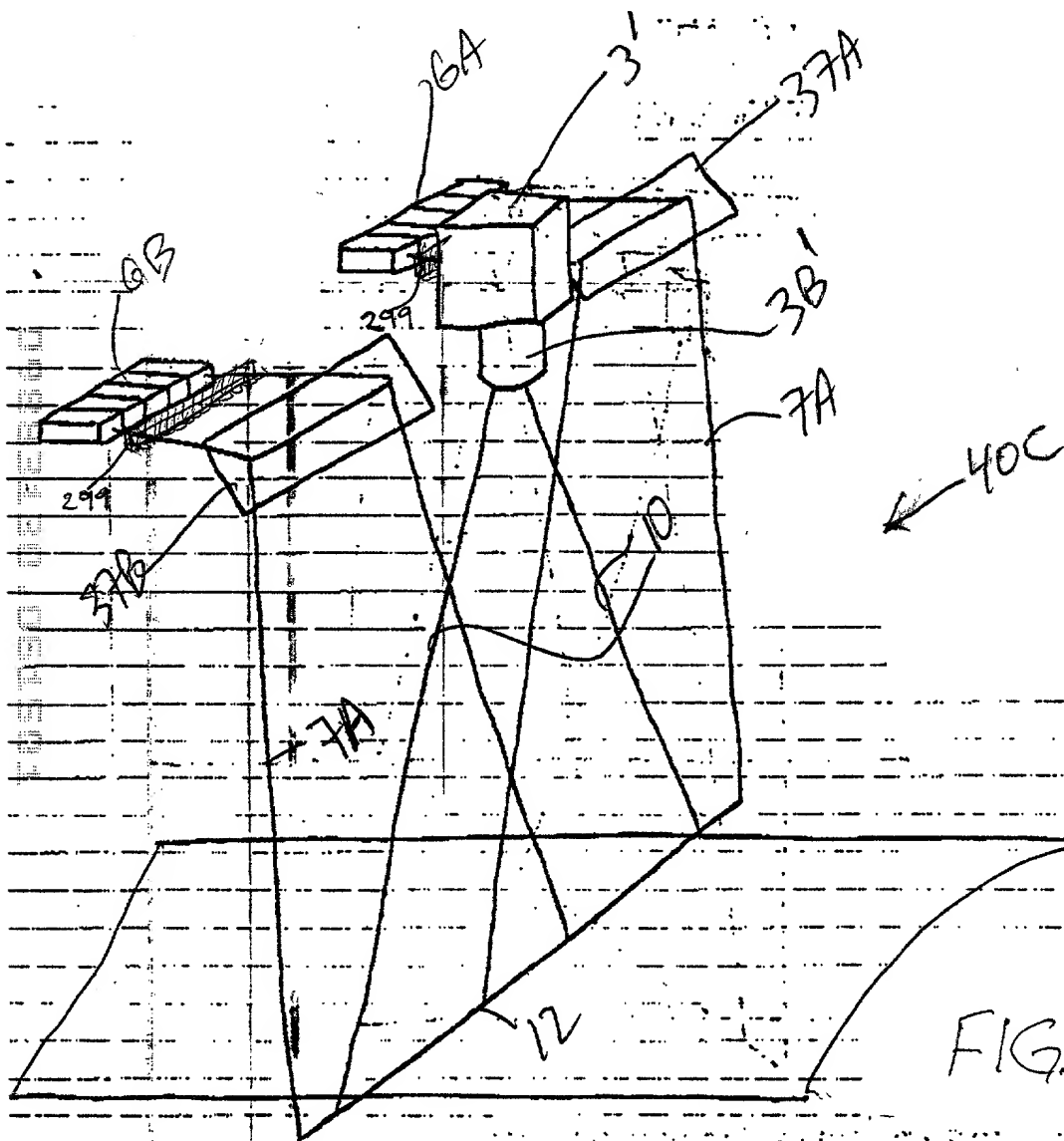


FIG. 2E1

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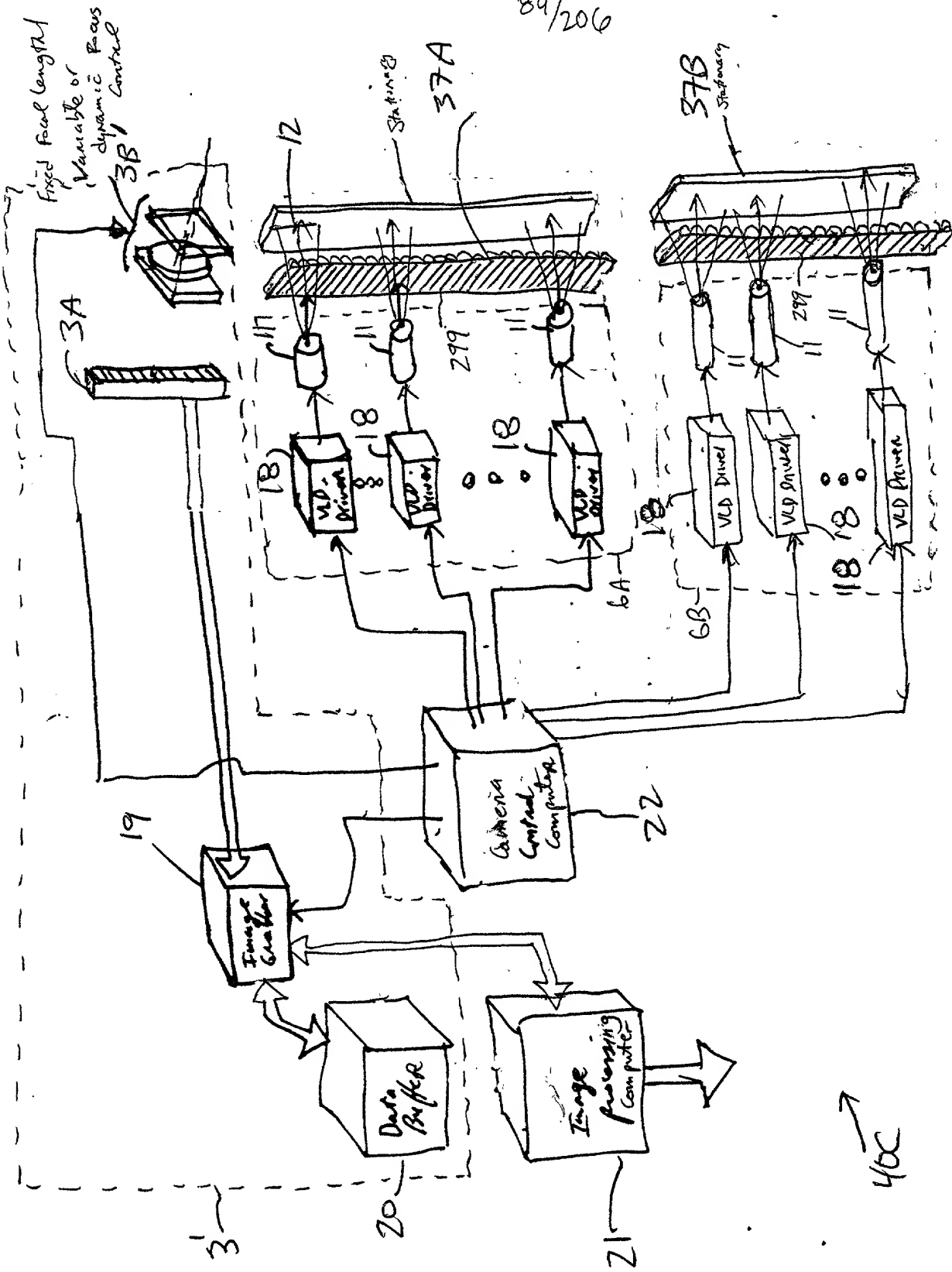


FIG. 2E2

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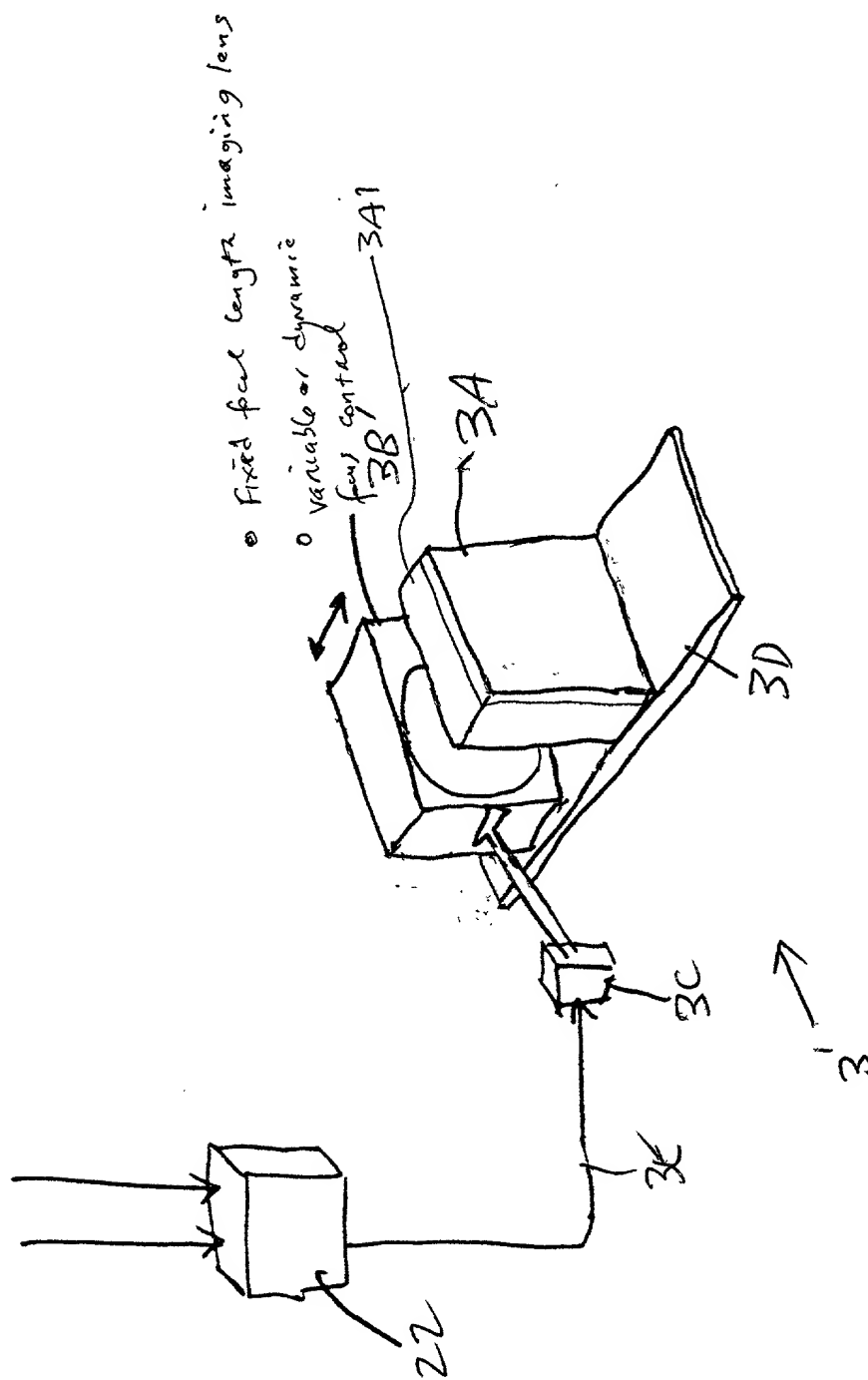


FIG. 2E3

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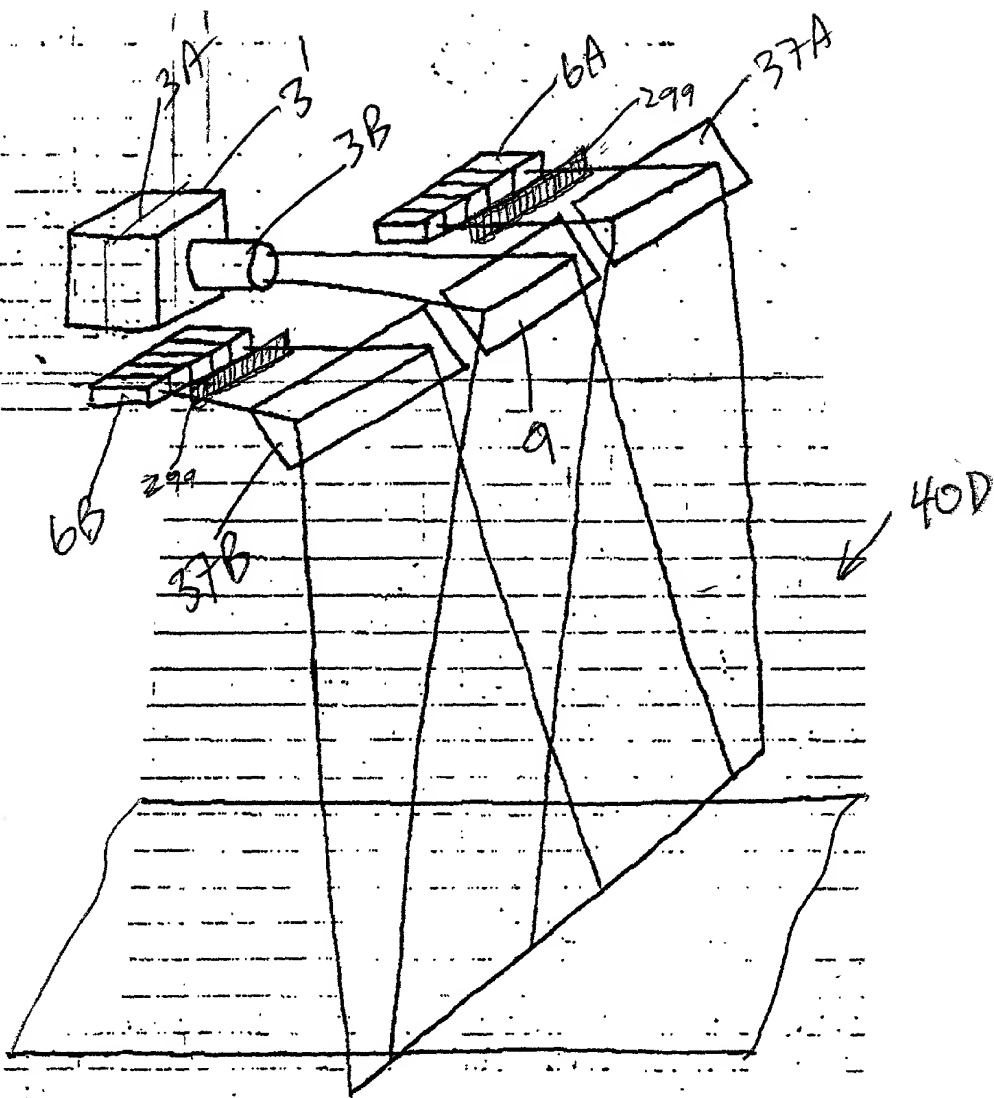


FIG. 2F1

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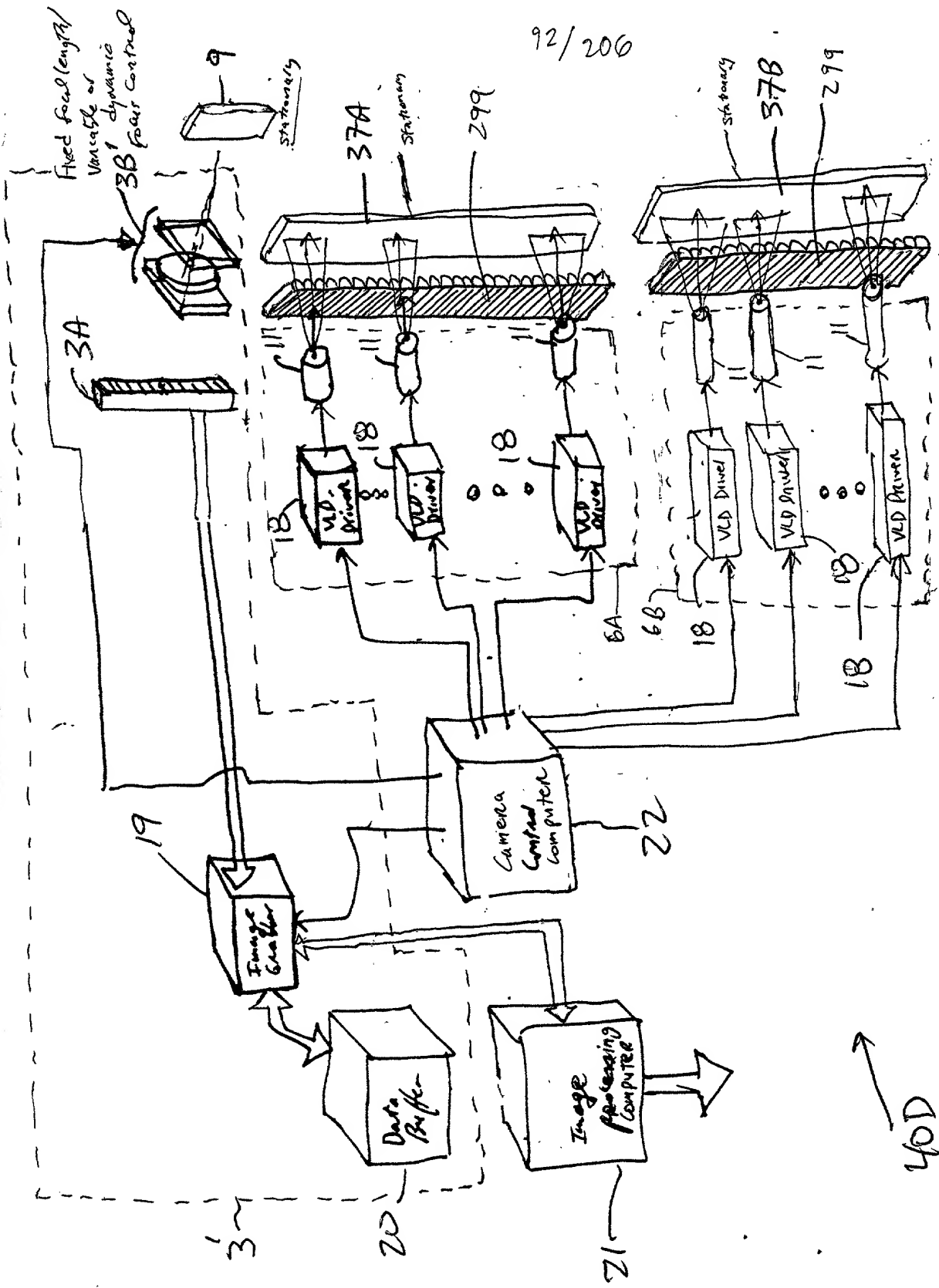


FIG 2F2

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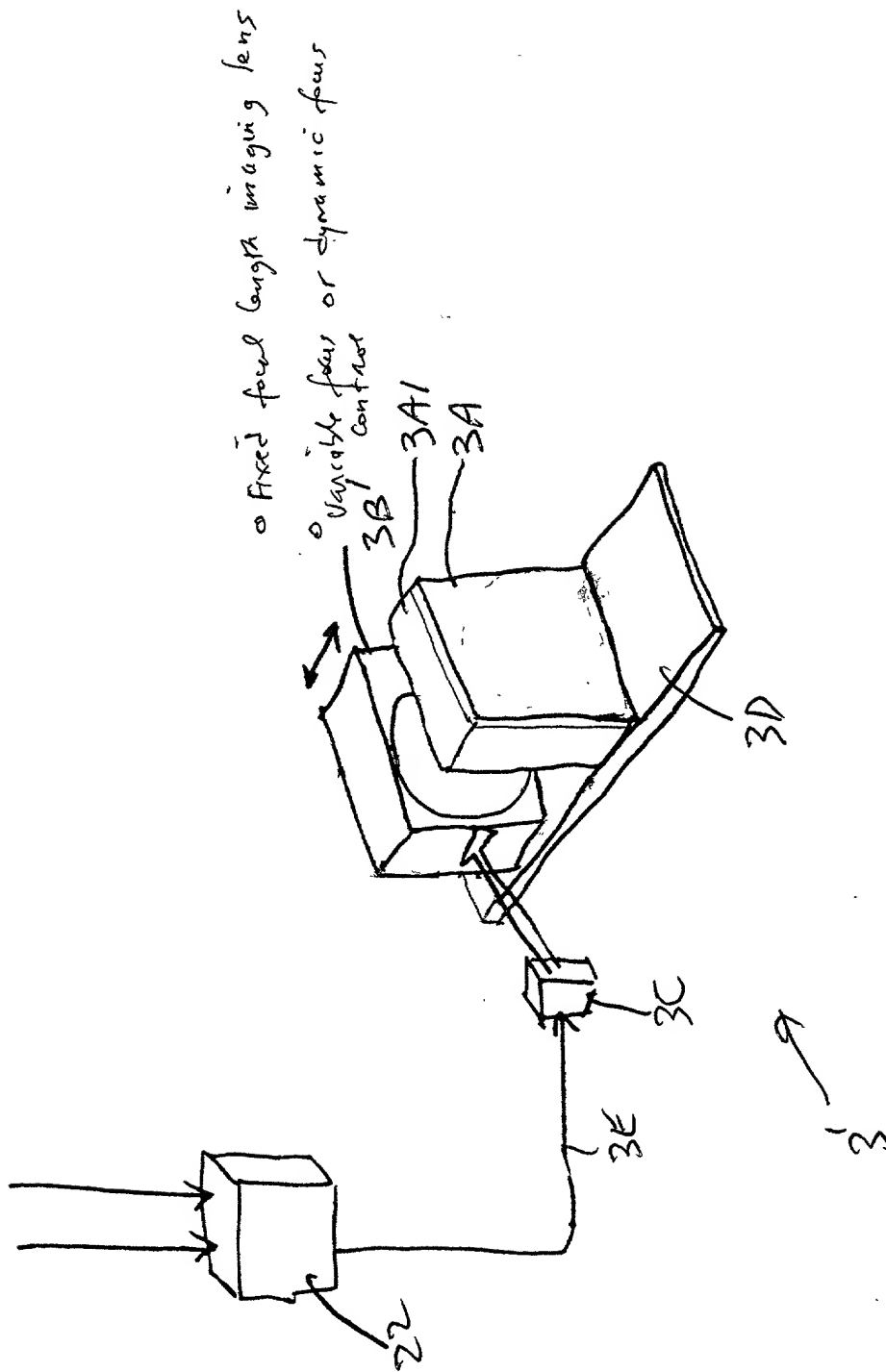


FIG. 2F3

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Top Conveyor Scanner:

- fixed focal length imaging lens
- variable focal distance control

Side Conveyor Scanner:

- fixed focal length imaging lens
- dynamic focal distance control

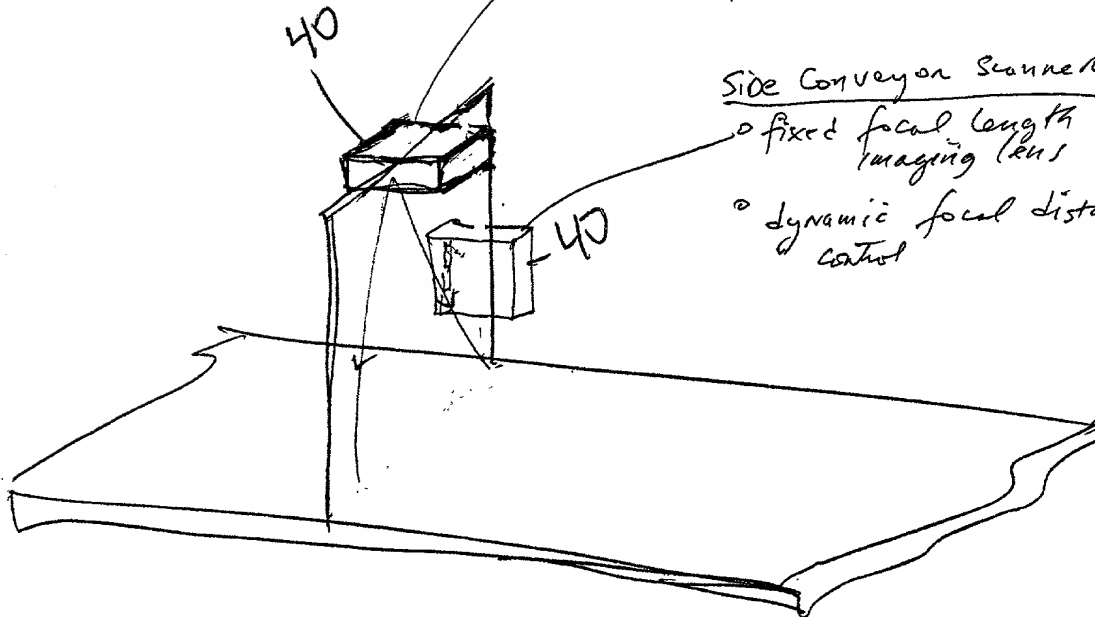


FIG. 2G

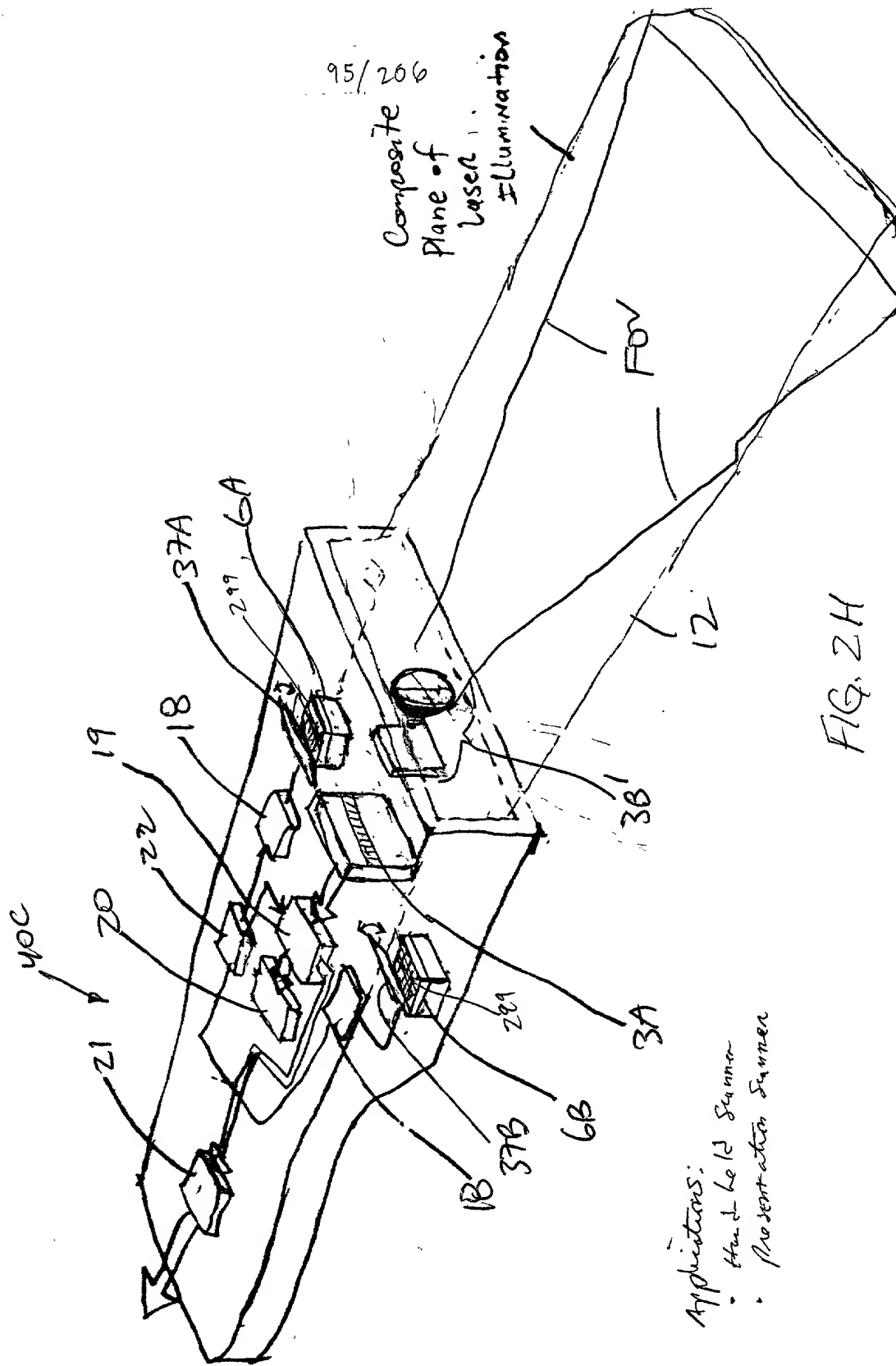
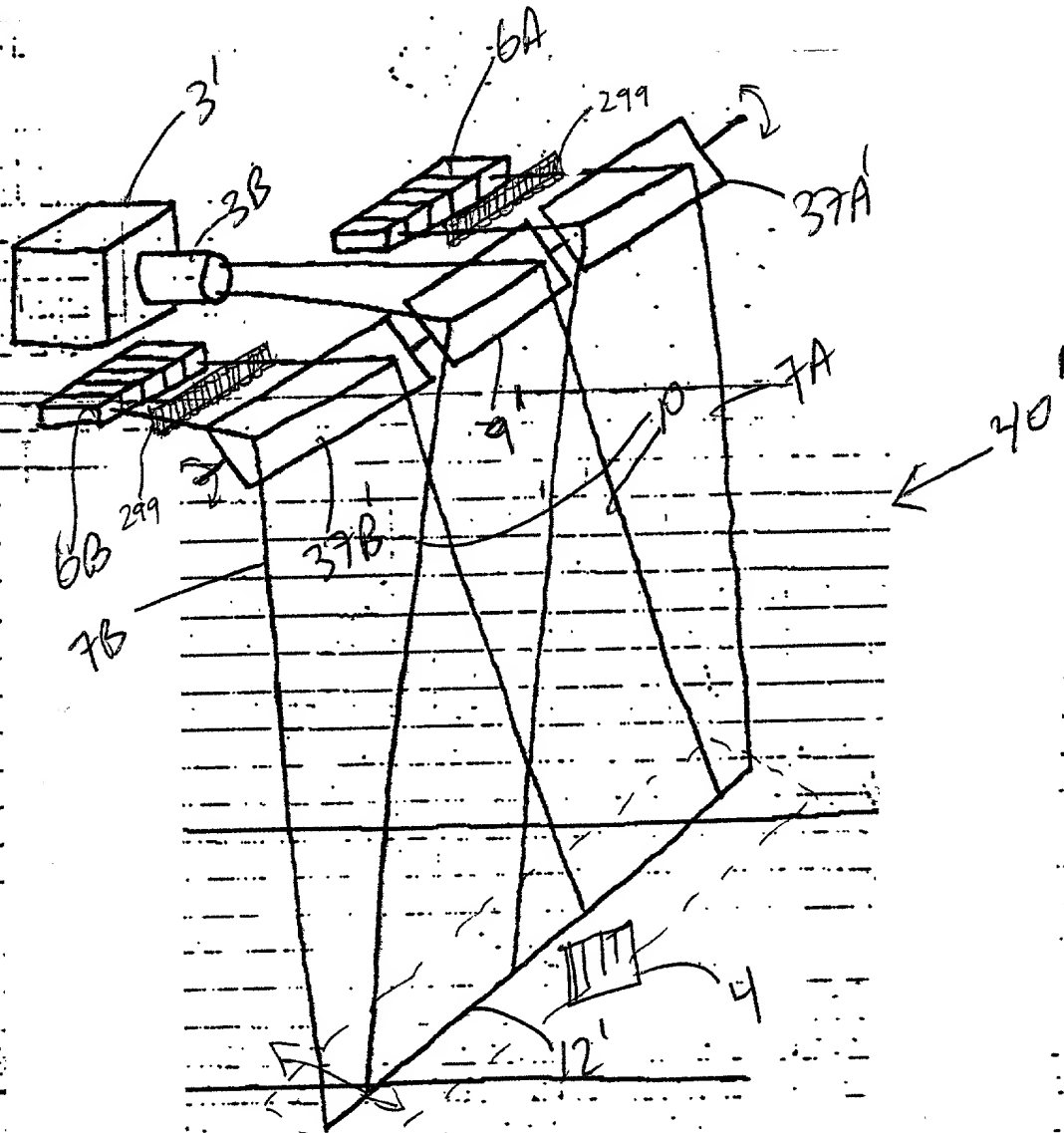


FIG. 2H

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3-D
Sensing
Region

FIG 2I2

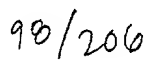


FIG. 2I3

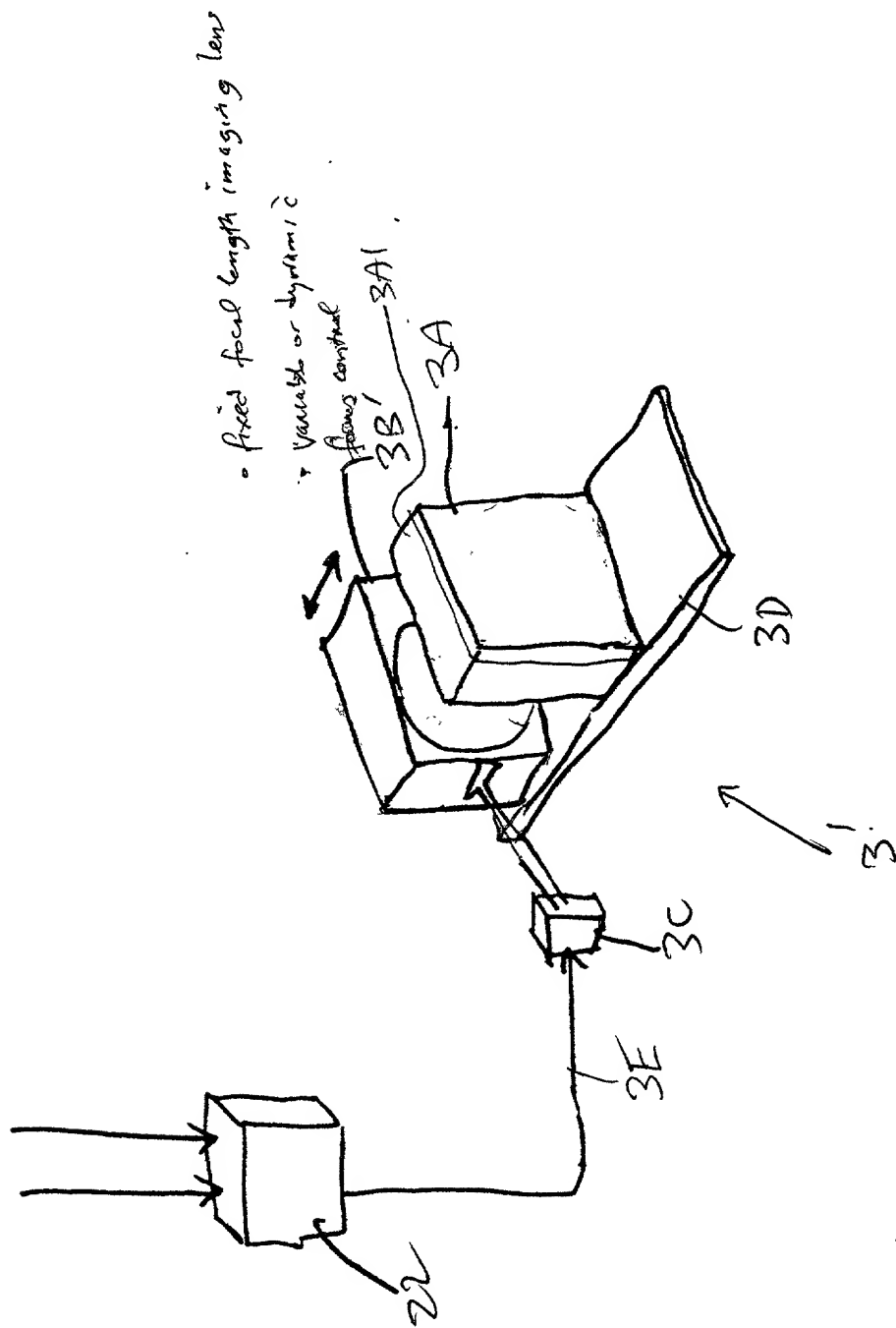


FIG. 2I4

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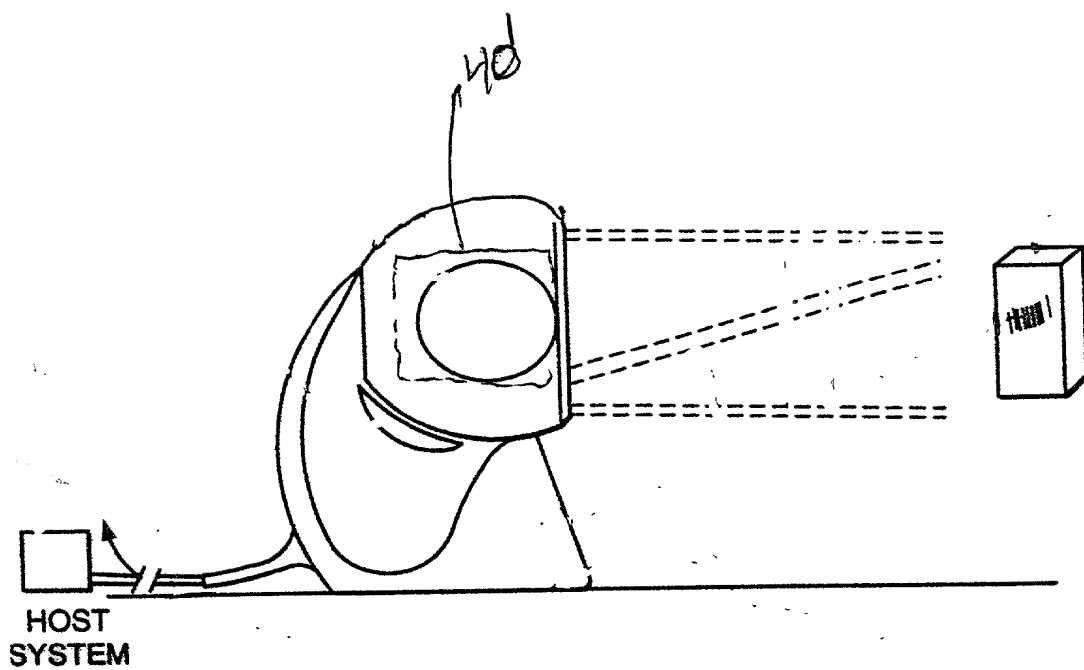


FIG. 2Ib

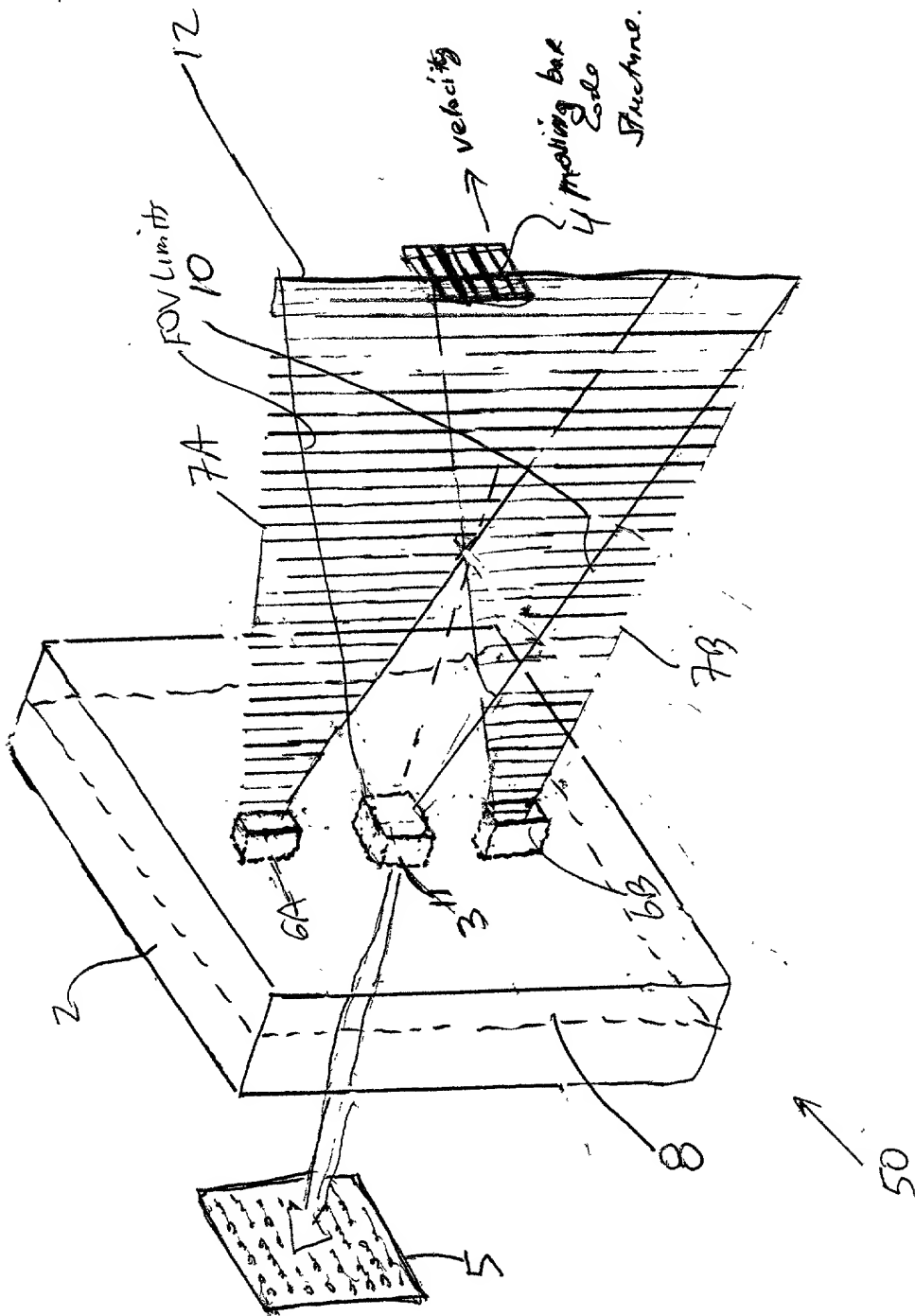


FIG 3A

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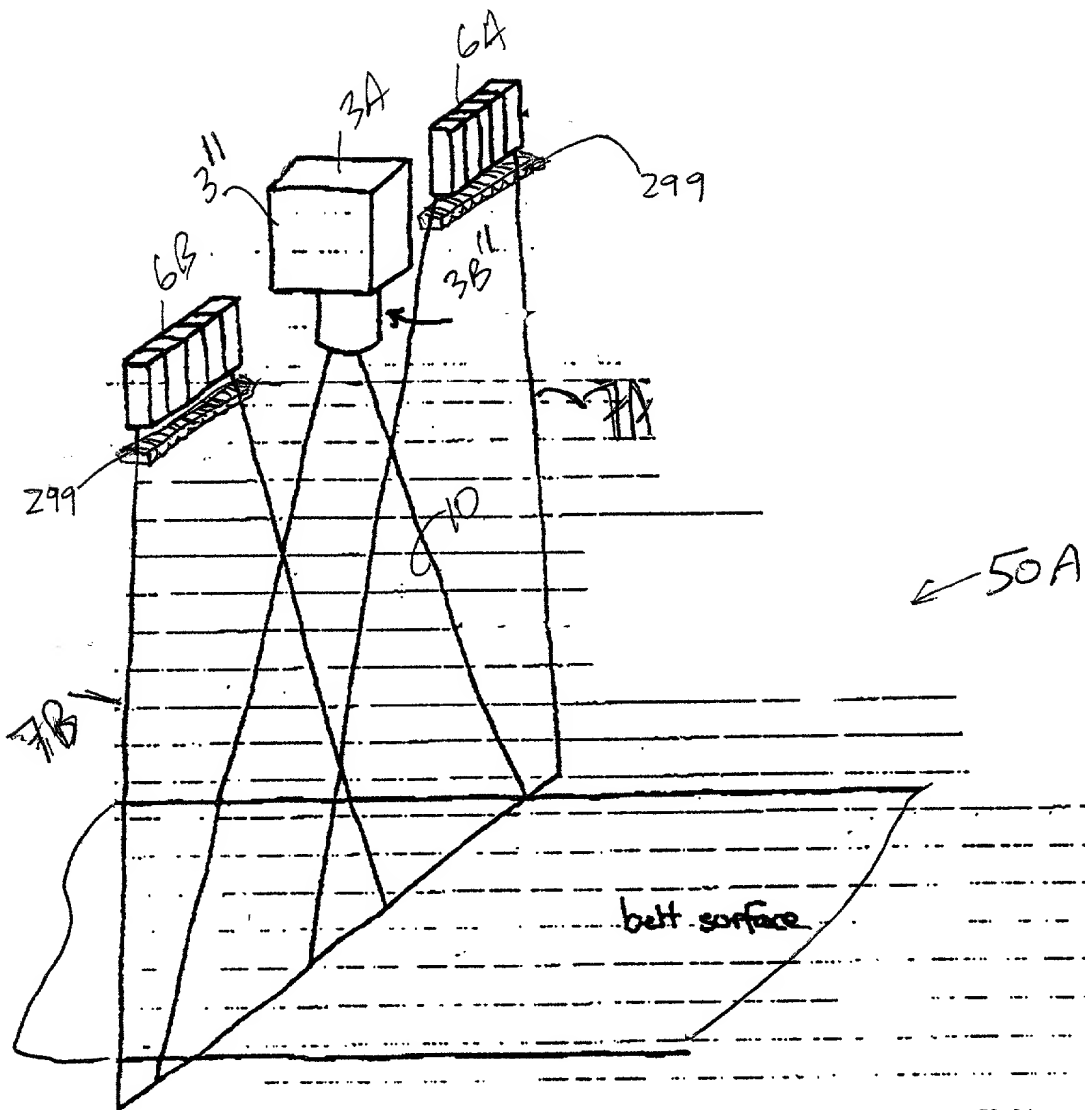


FIG. 3B1

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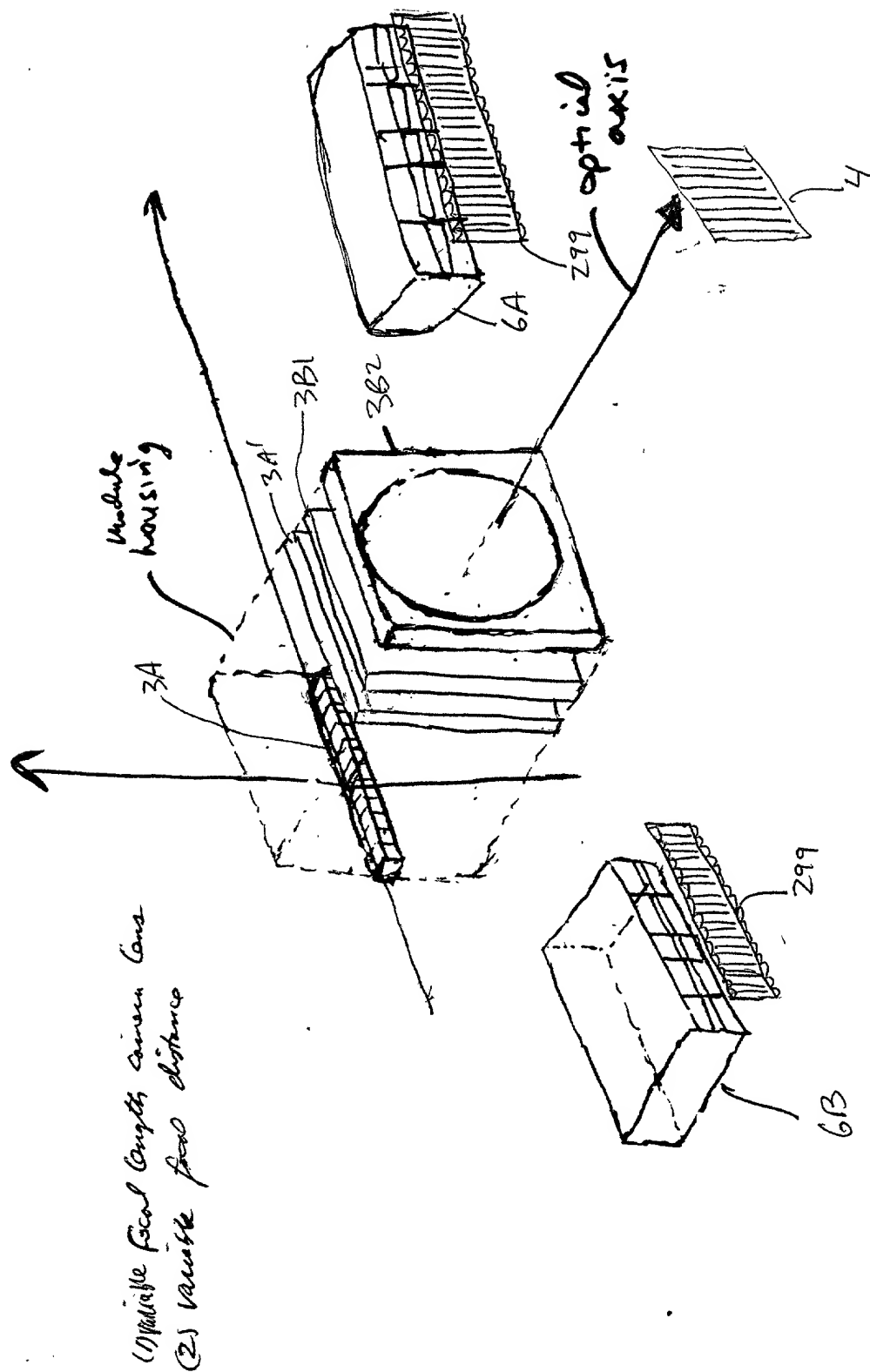
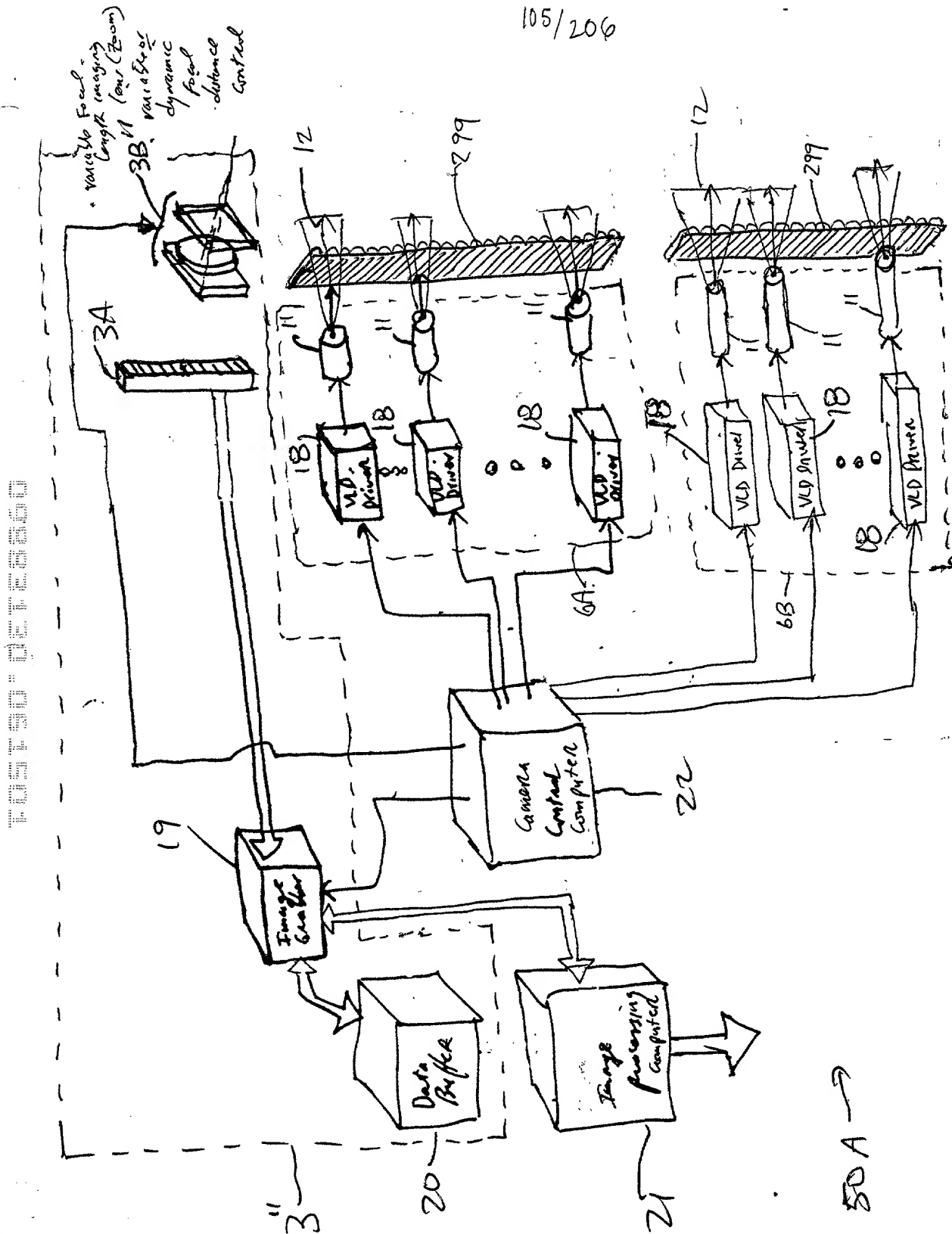
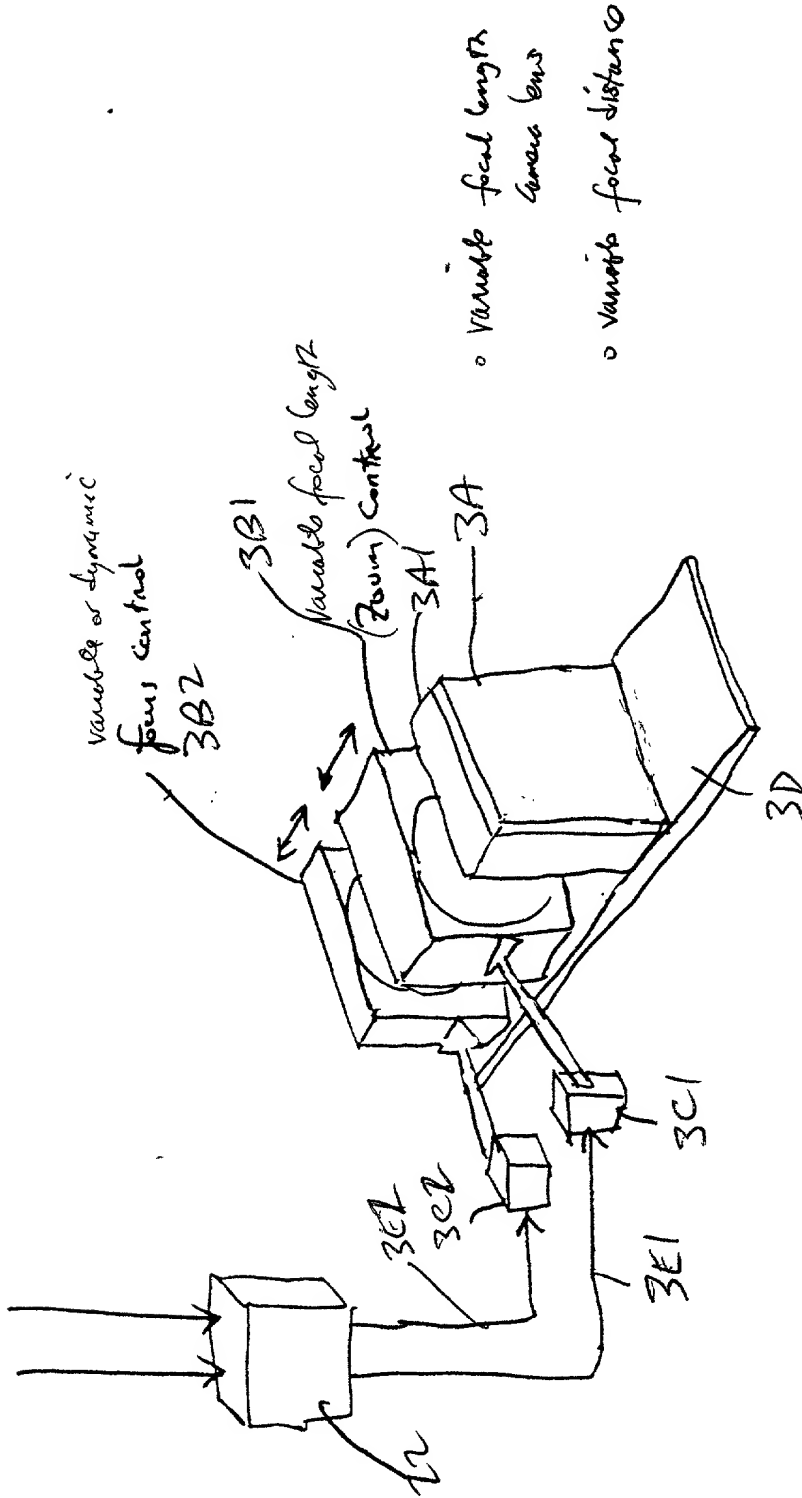


FIG. 3B2



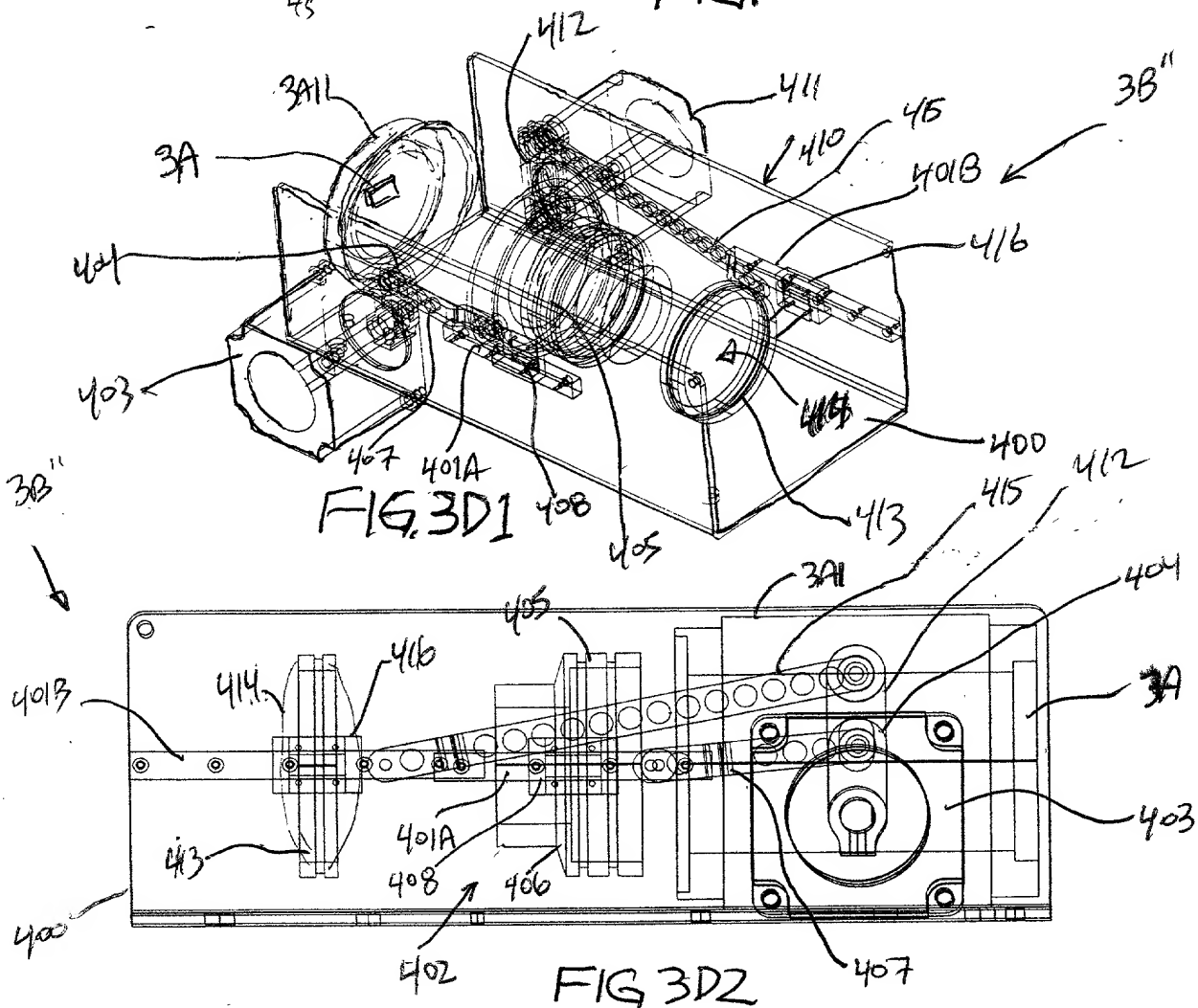
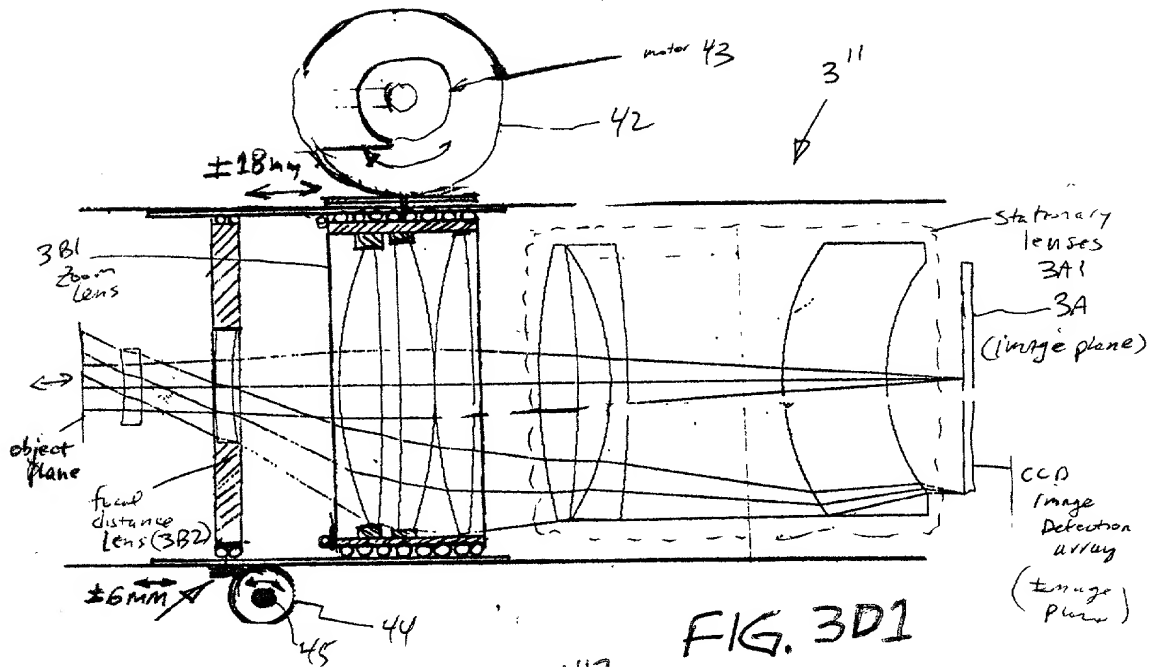
AG 307



- Variable focal length camera lens
- Variable focal distance

FIG. 3C2

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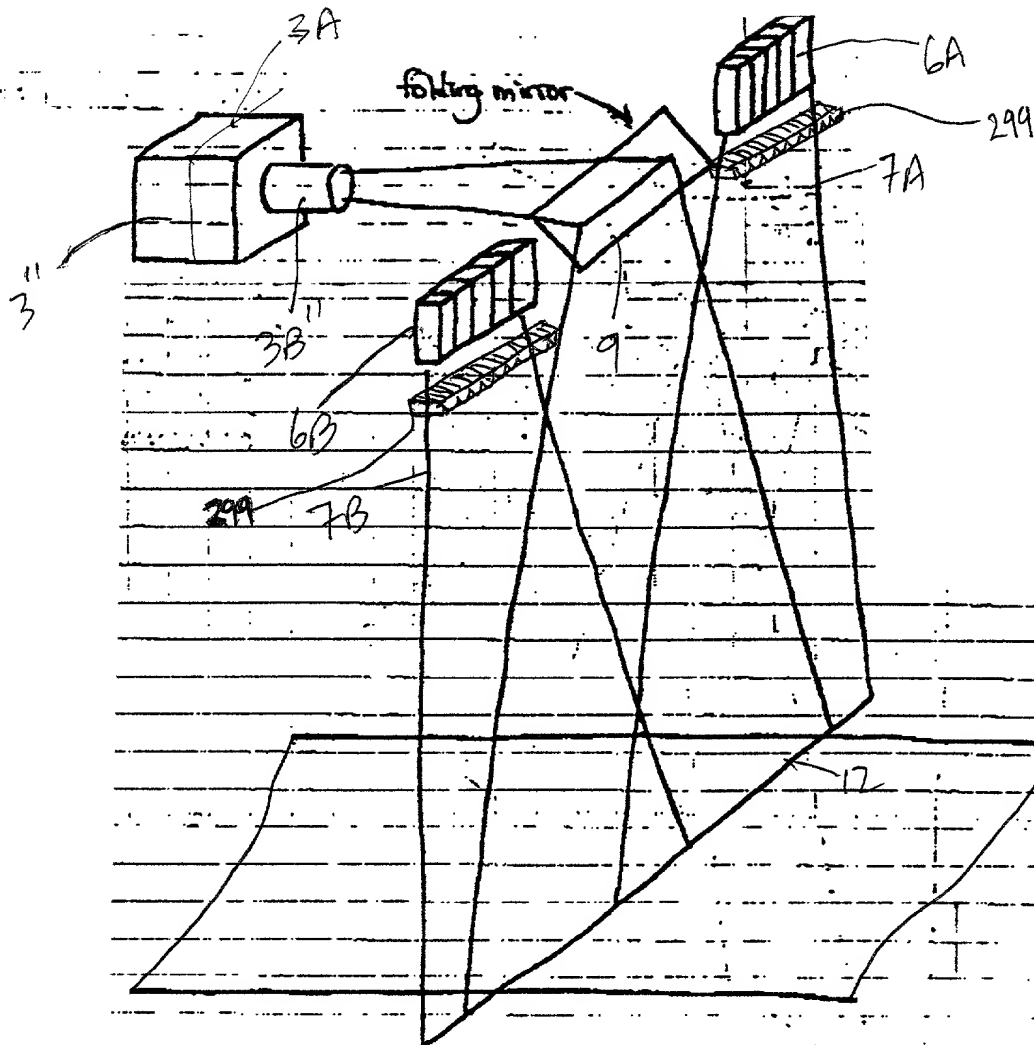
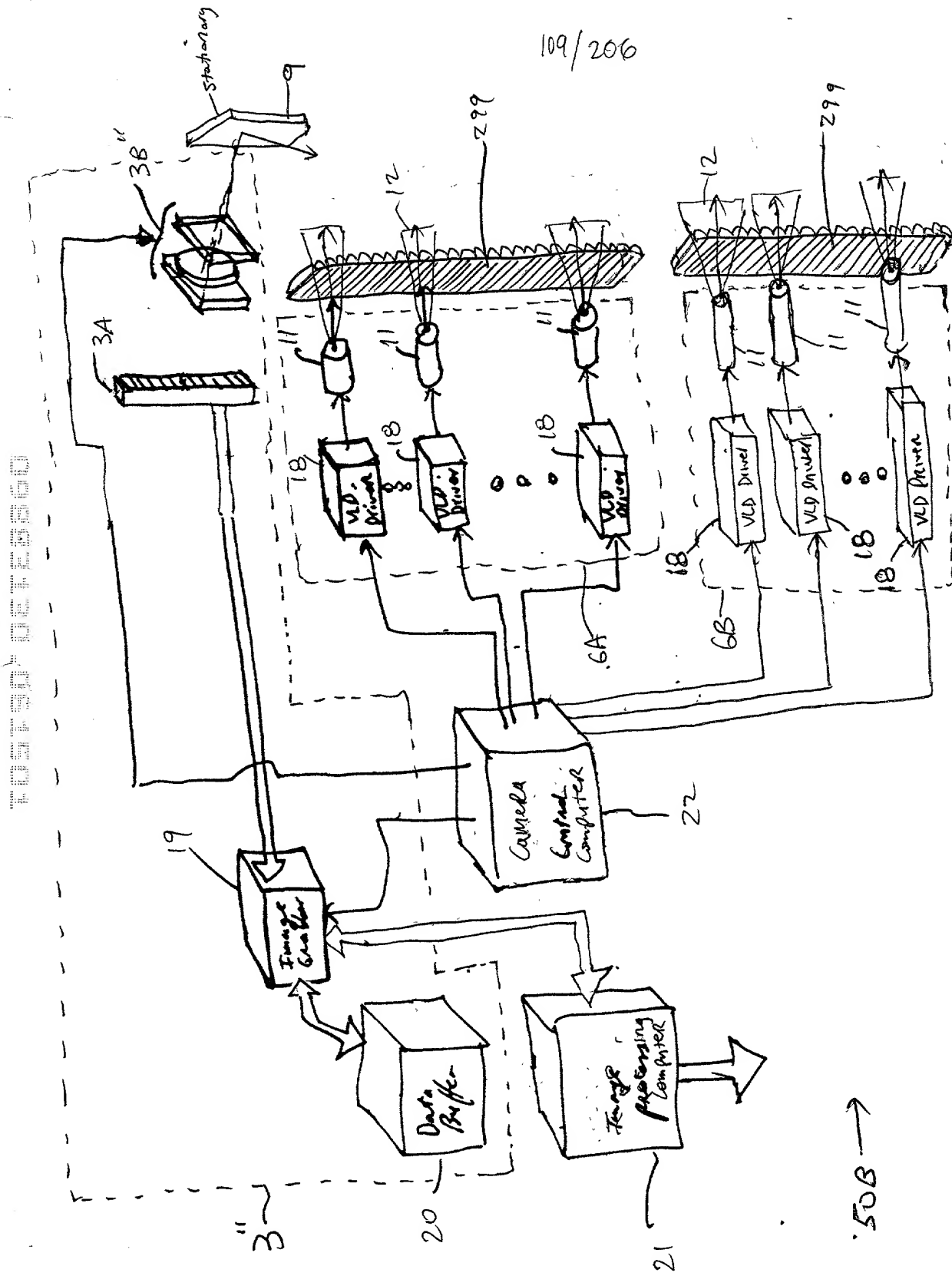


FIG. 3E1

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50B →

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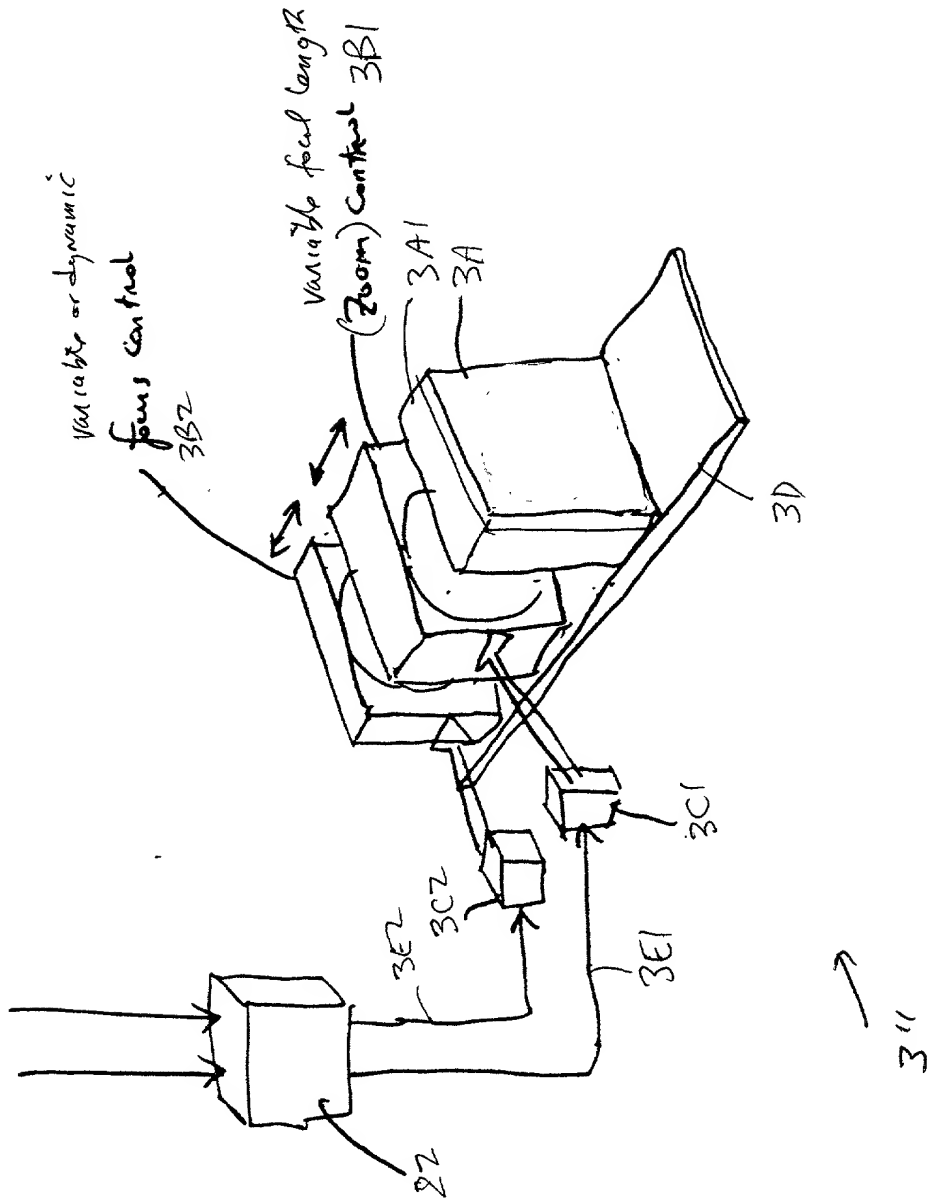
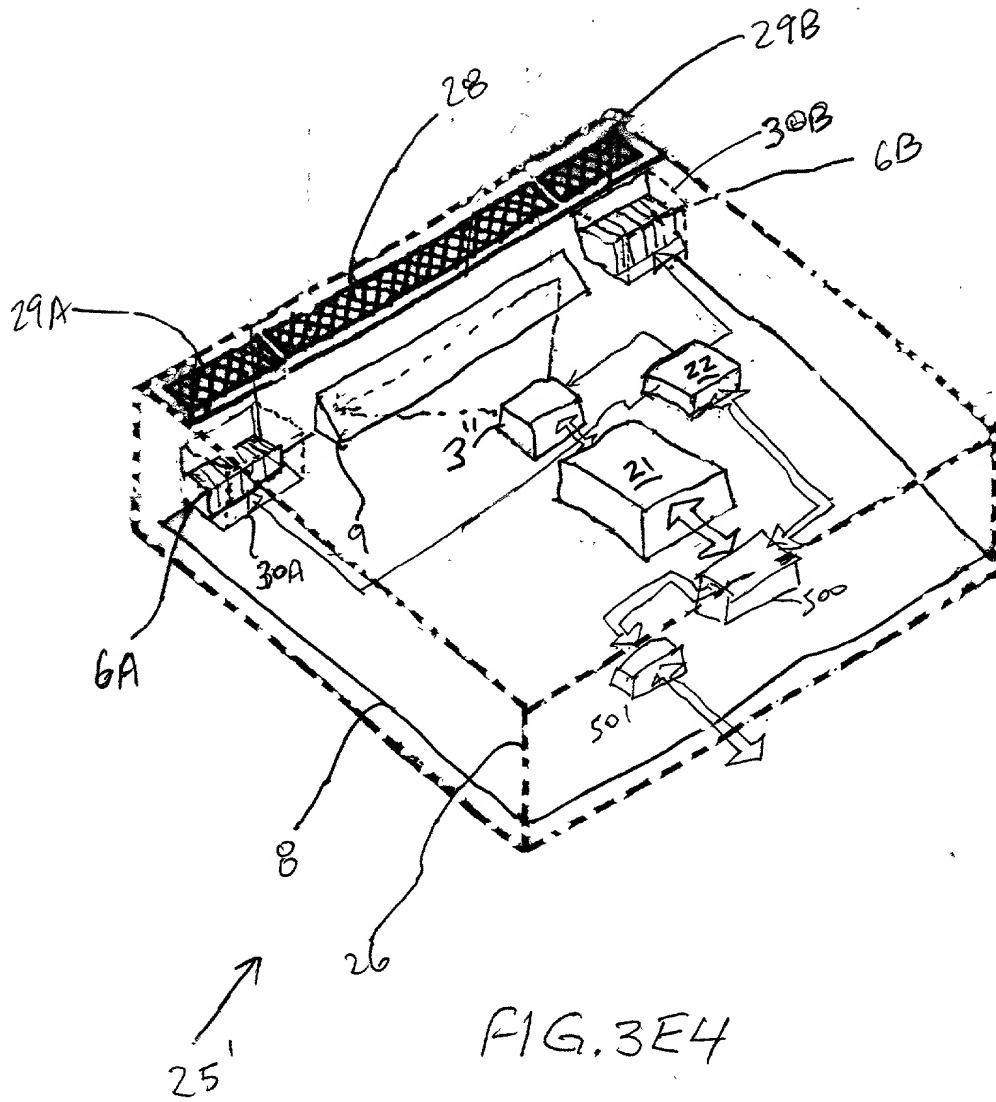


FIG. 3E3



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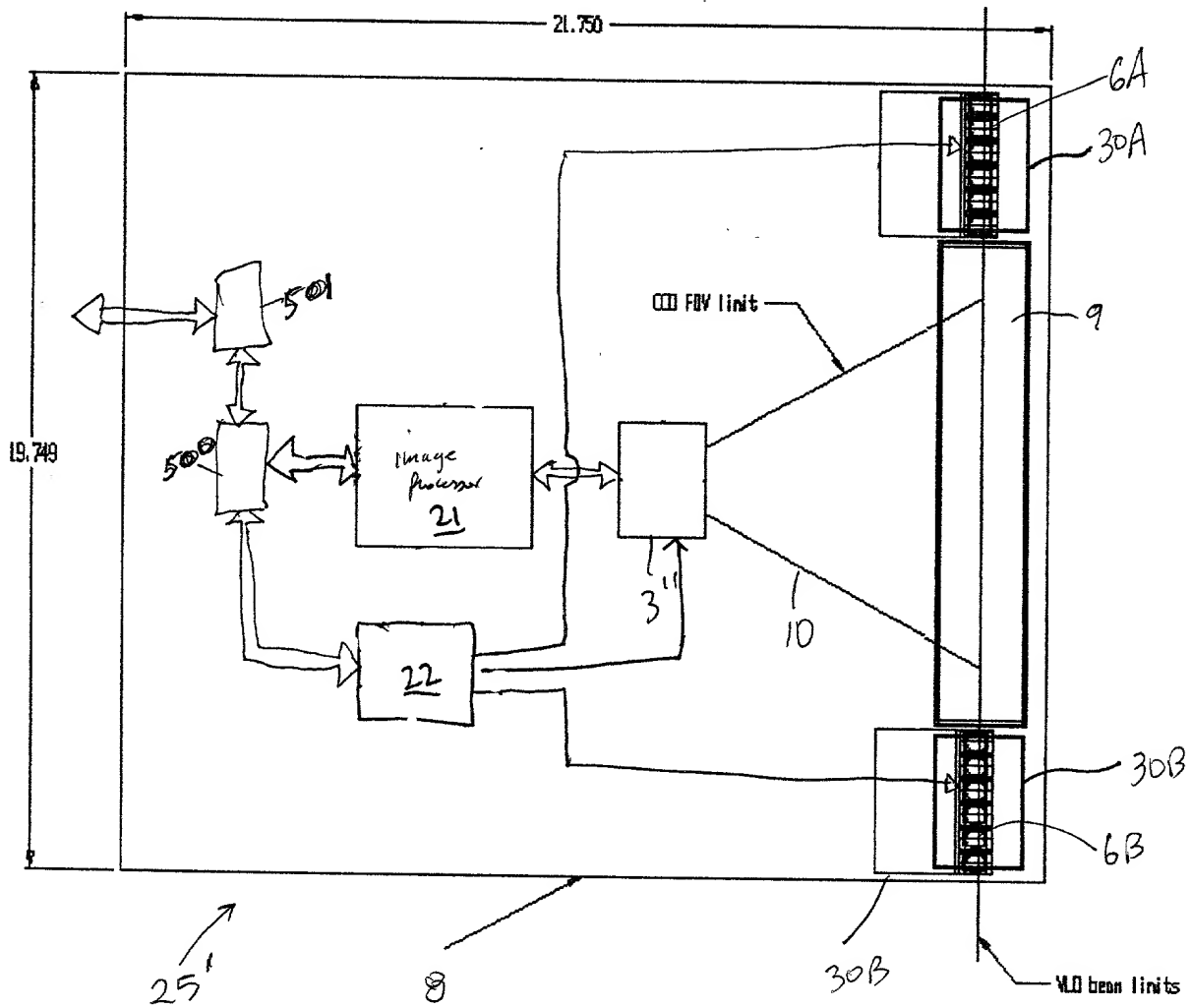


FIG. 3E5

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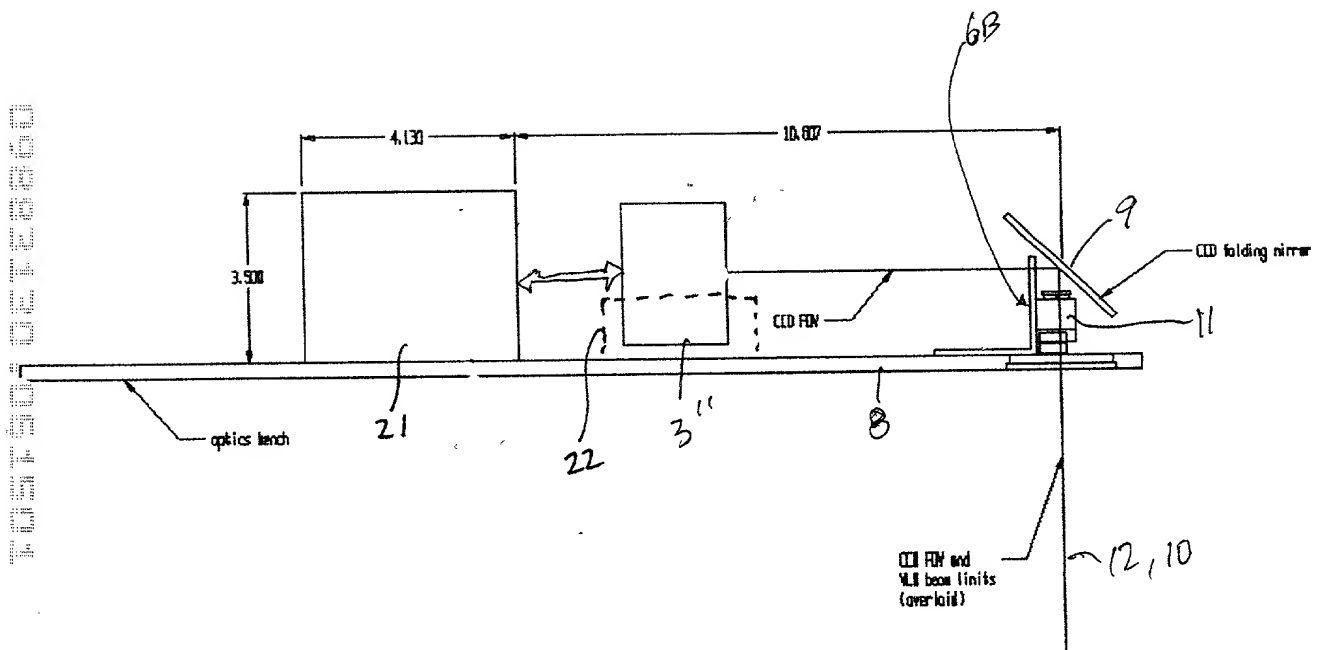


FIG. 3E7

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*Variable FOV

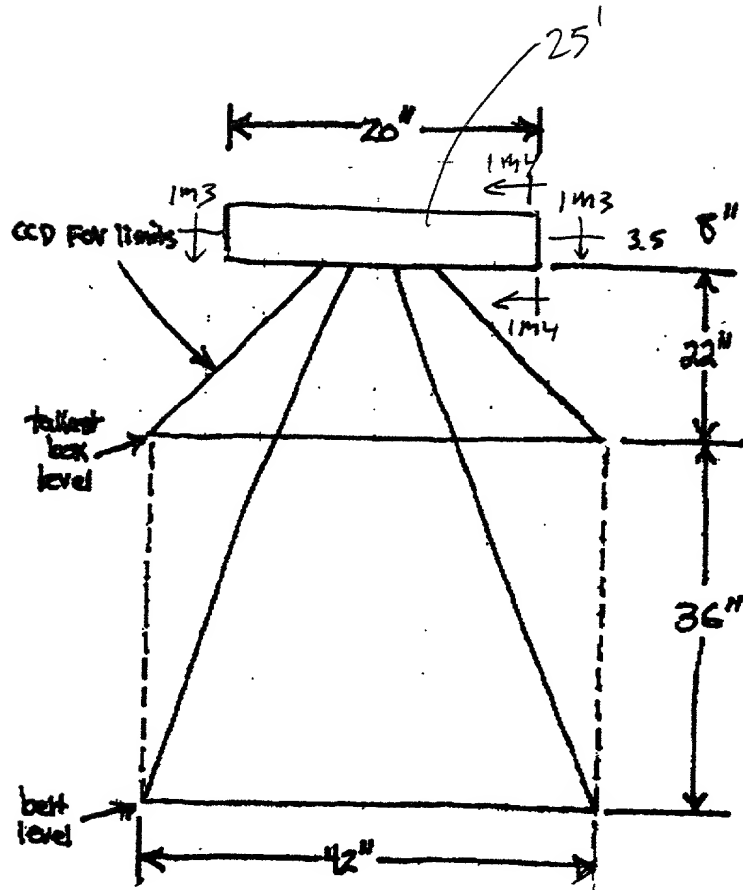


FIG. 3E8

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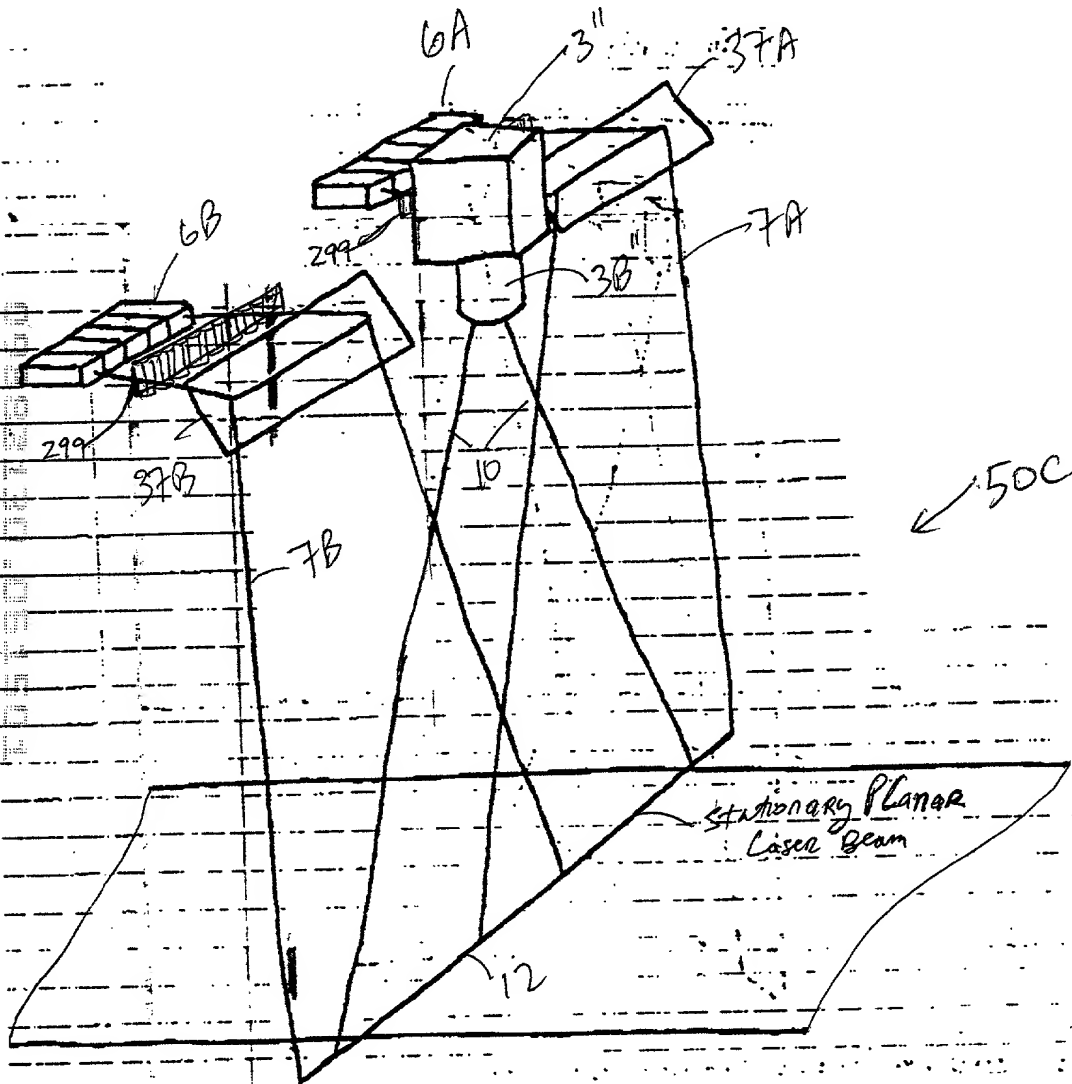


FIG. 3F1

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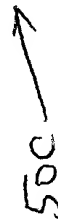


FIG. 3F2

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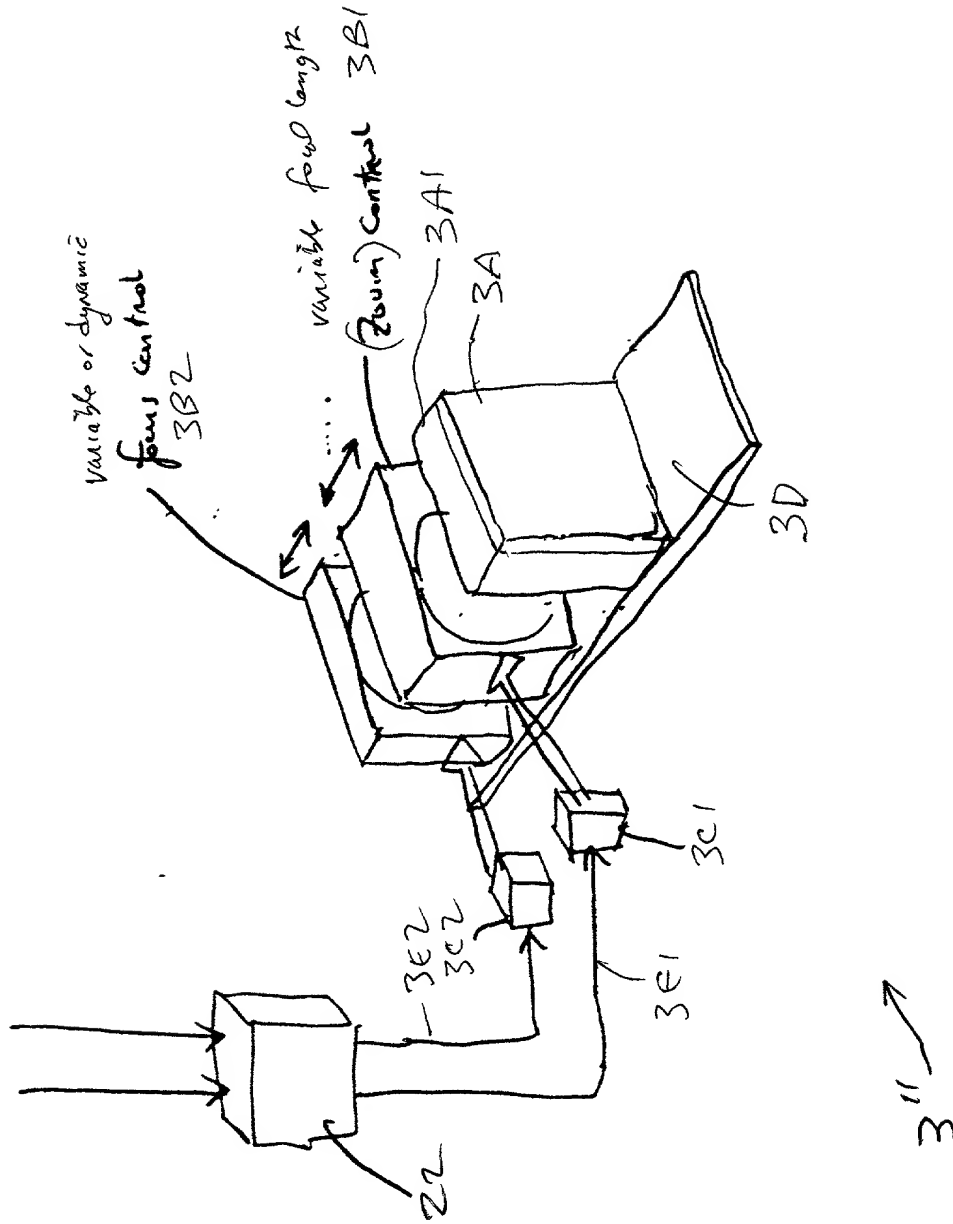


FIG. 3F3

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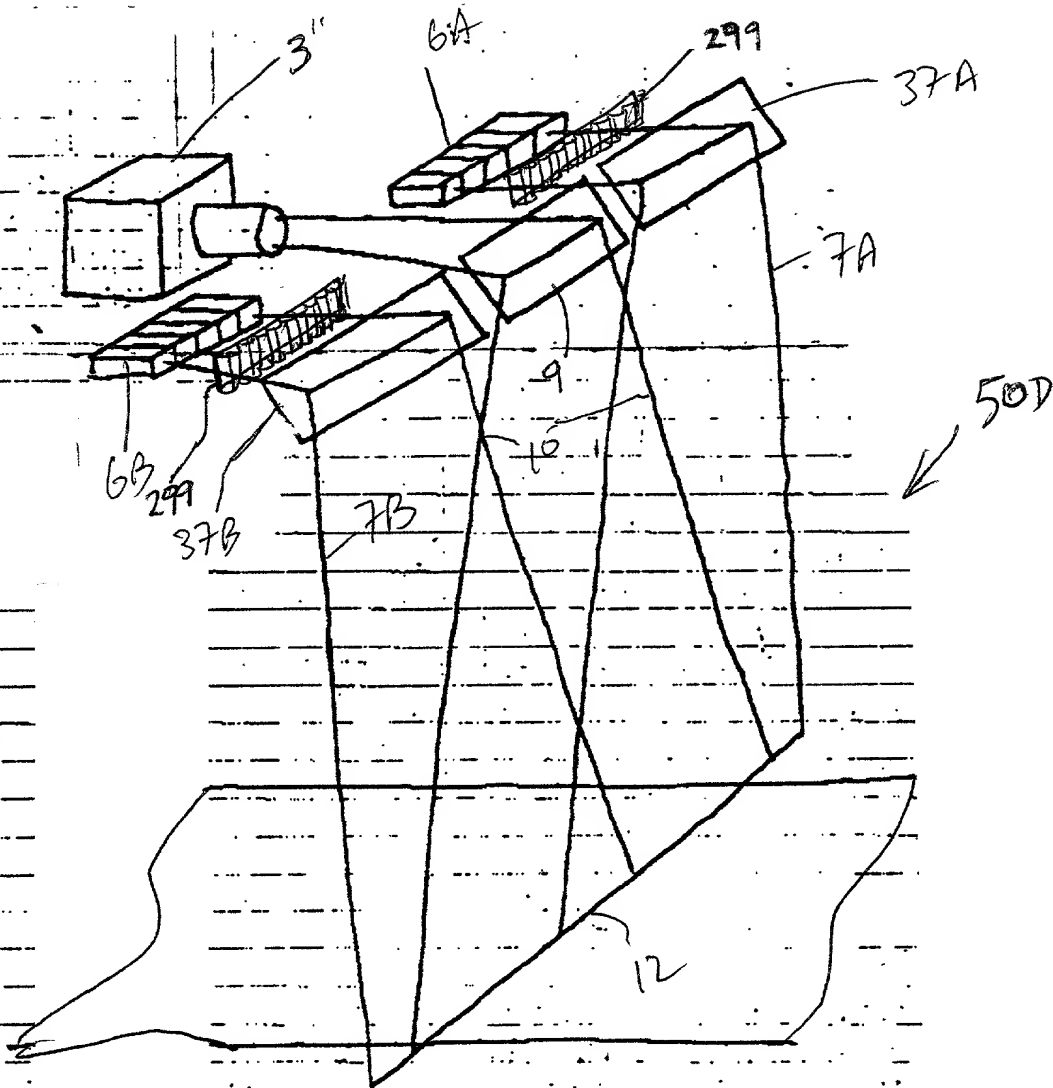
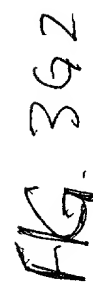


FIG. 351



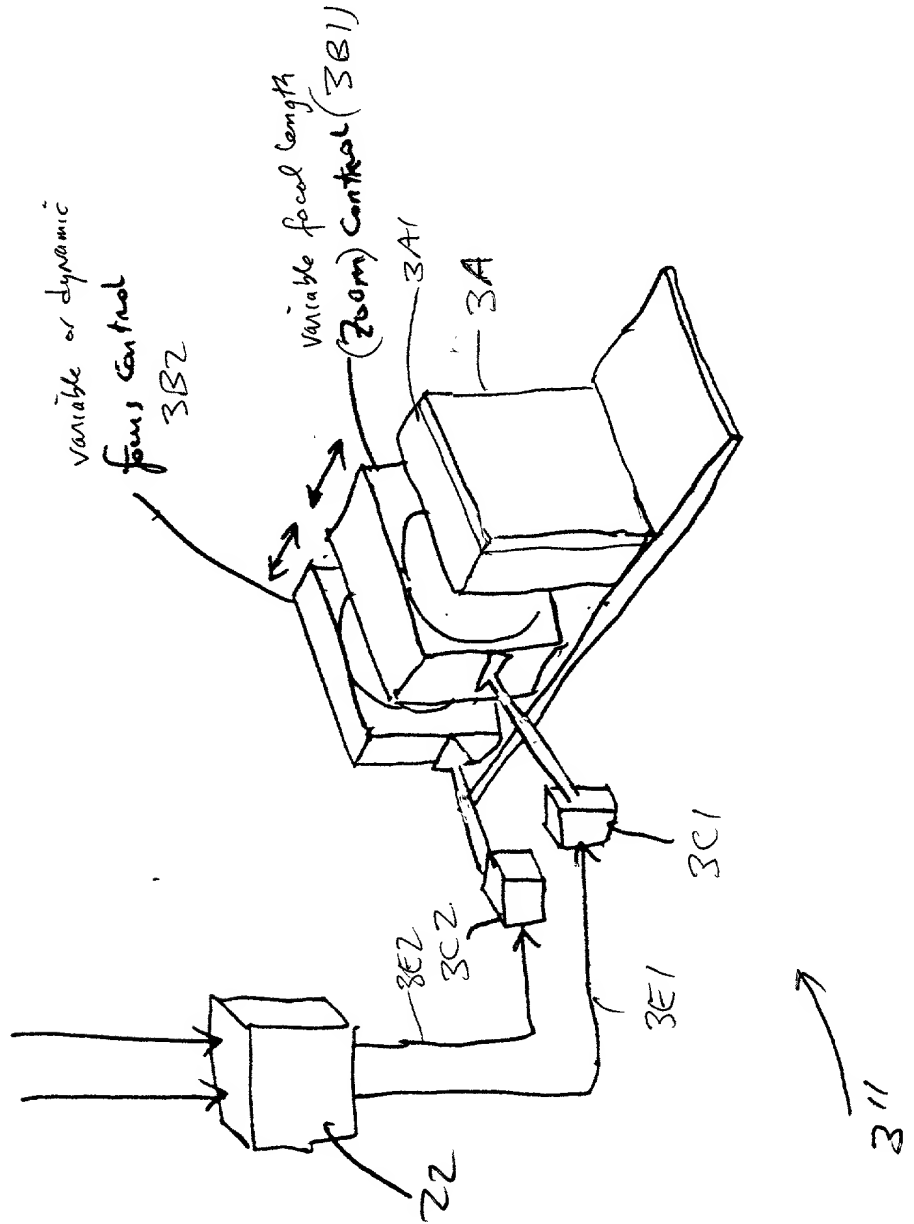


FIG. 3Q3

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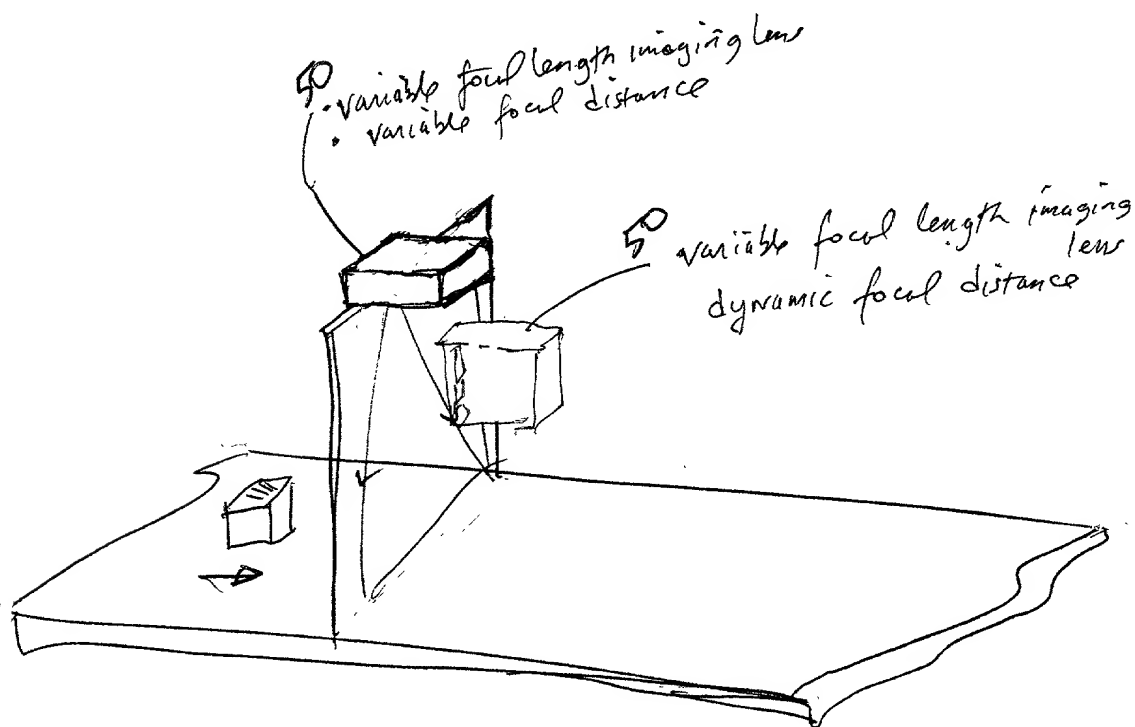


FIG. 3H

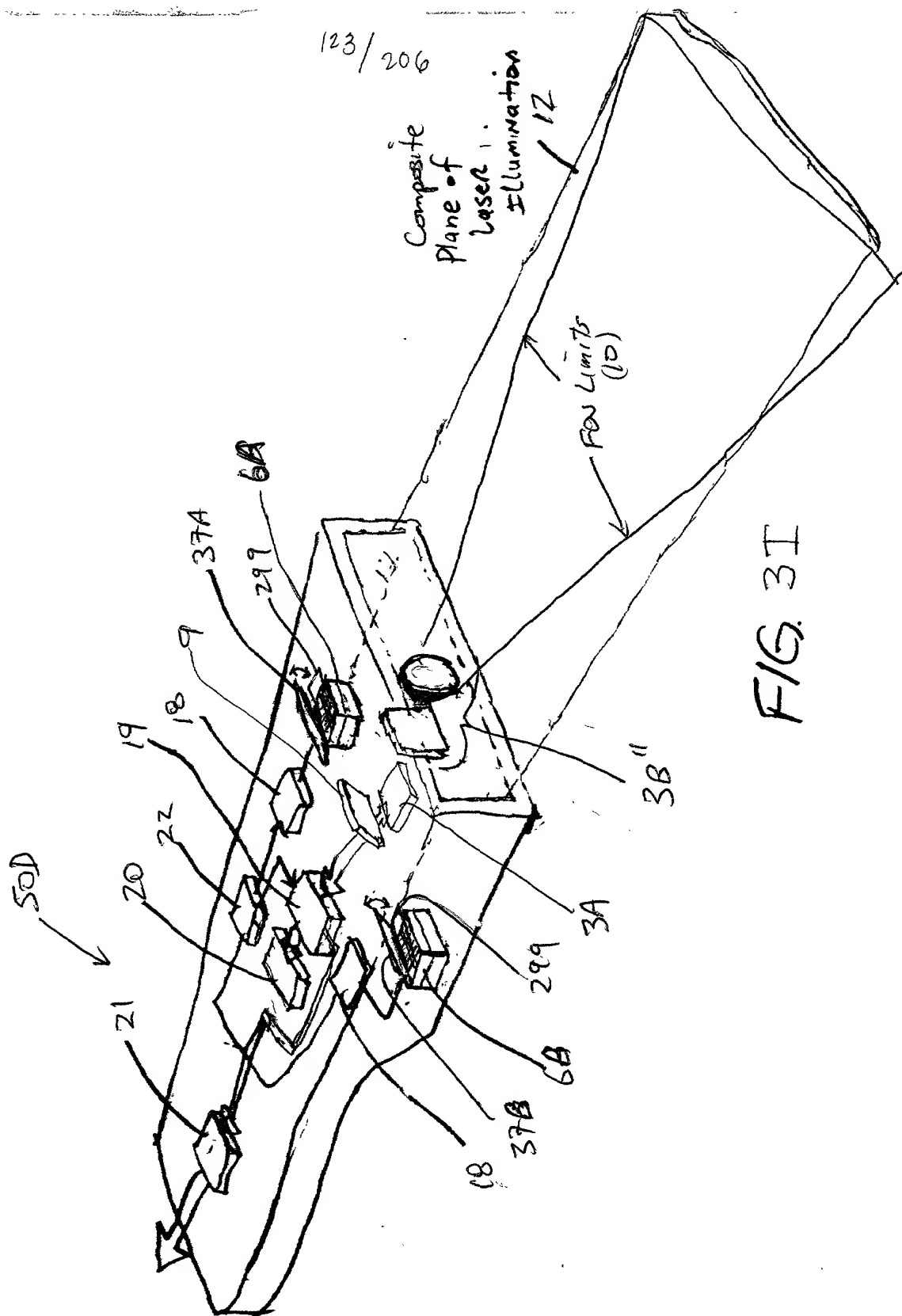


FIG. 3I

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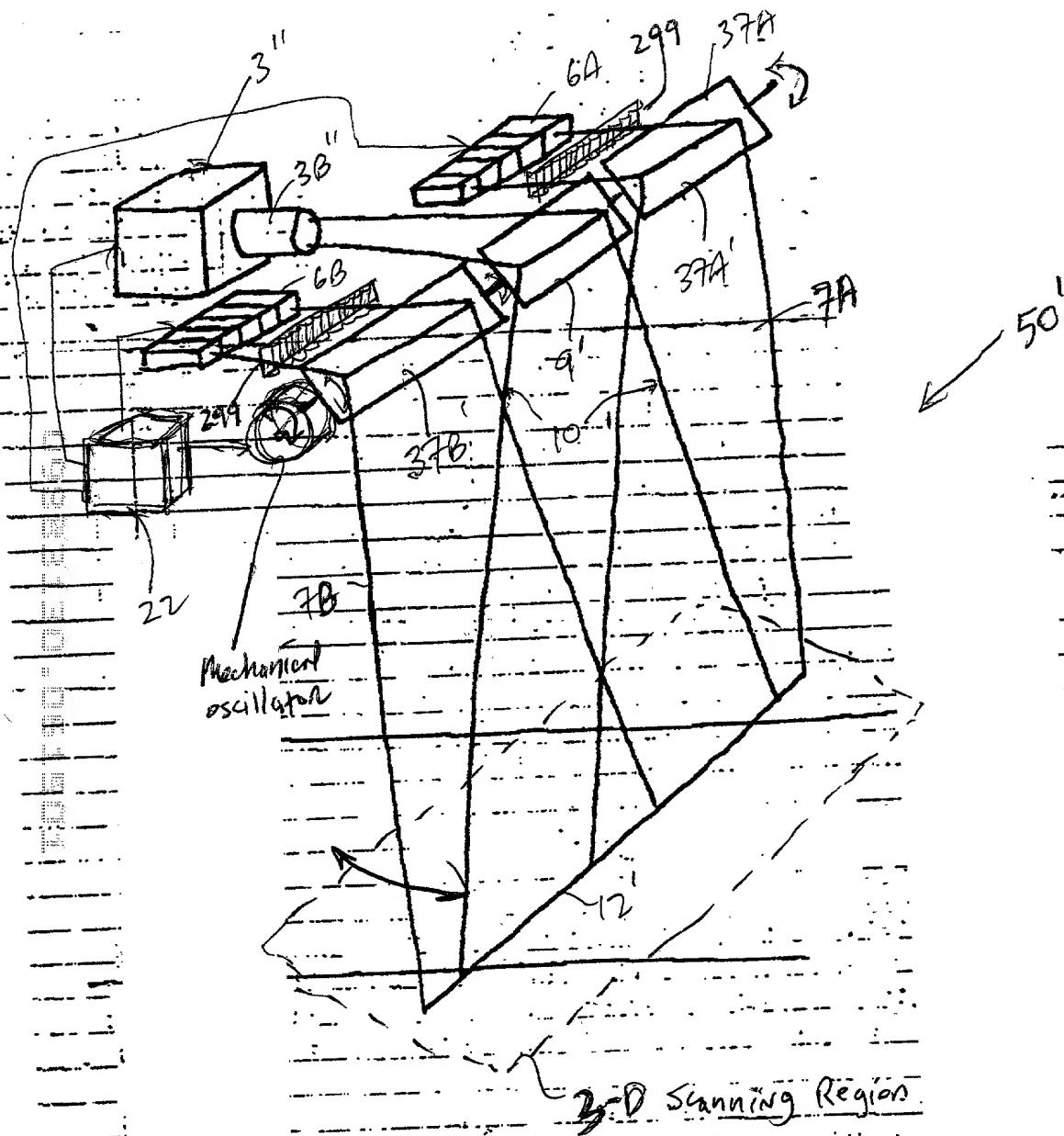
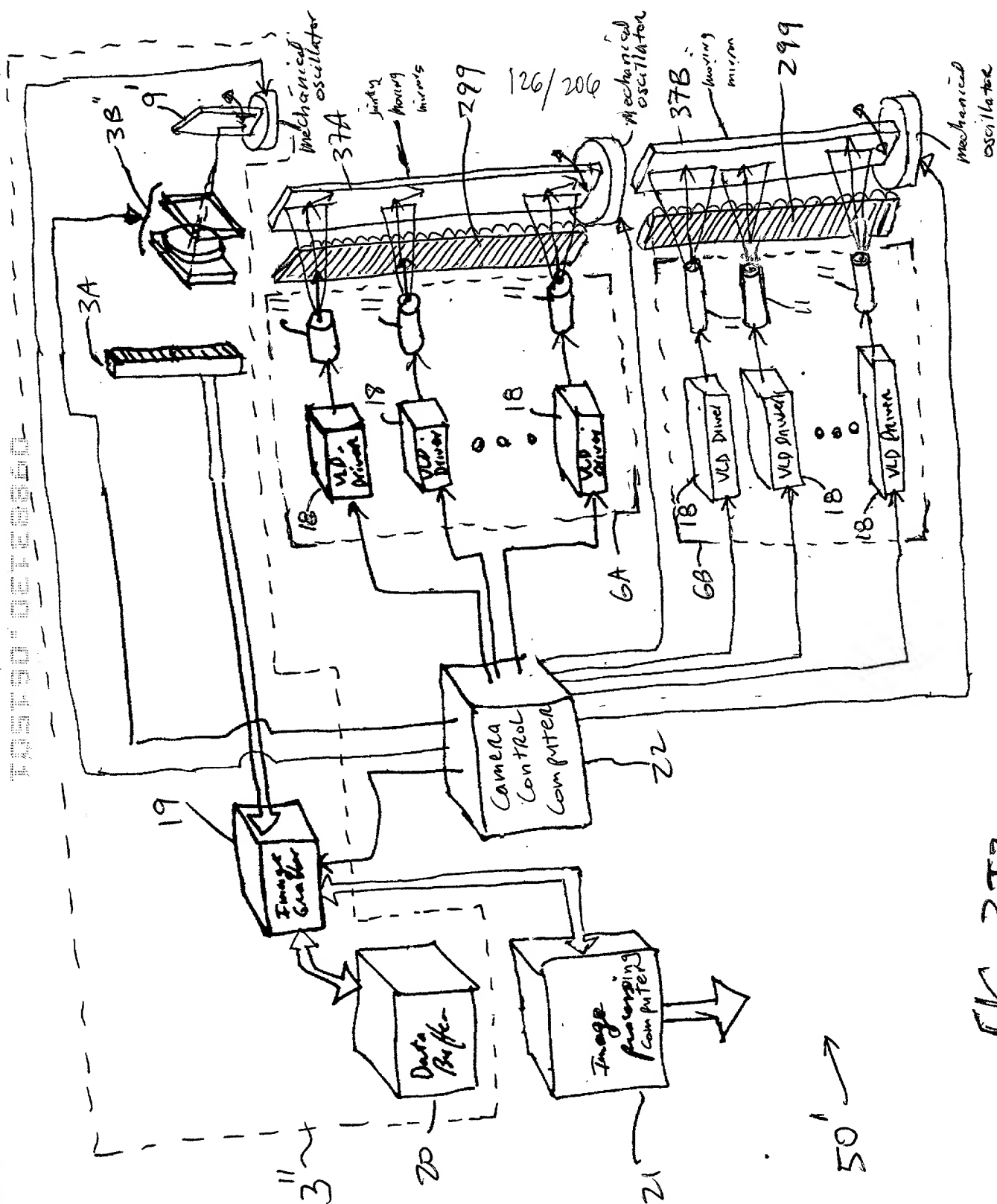


FIG 3J2

[illegible]

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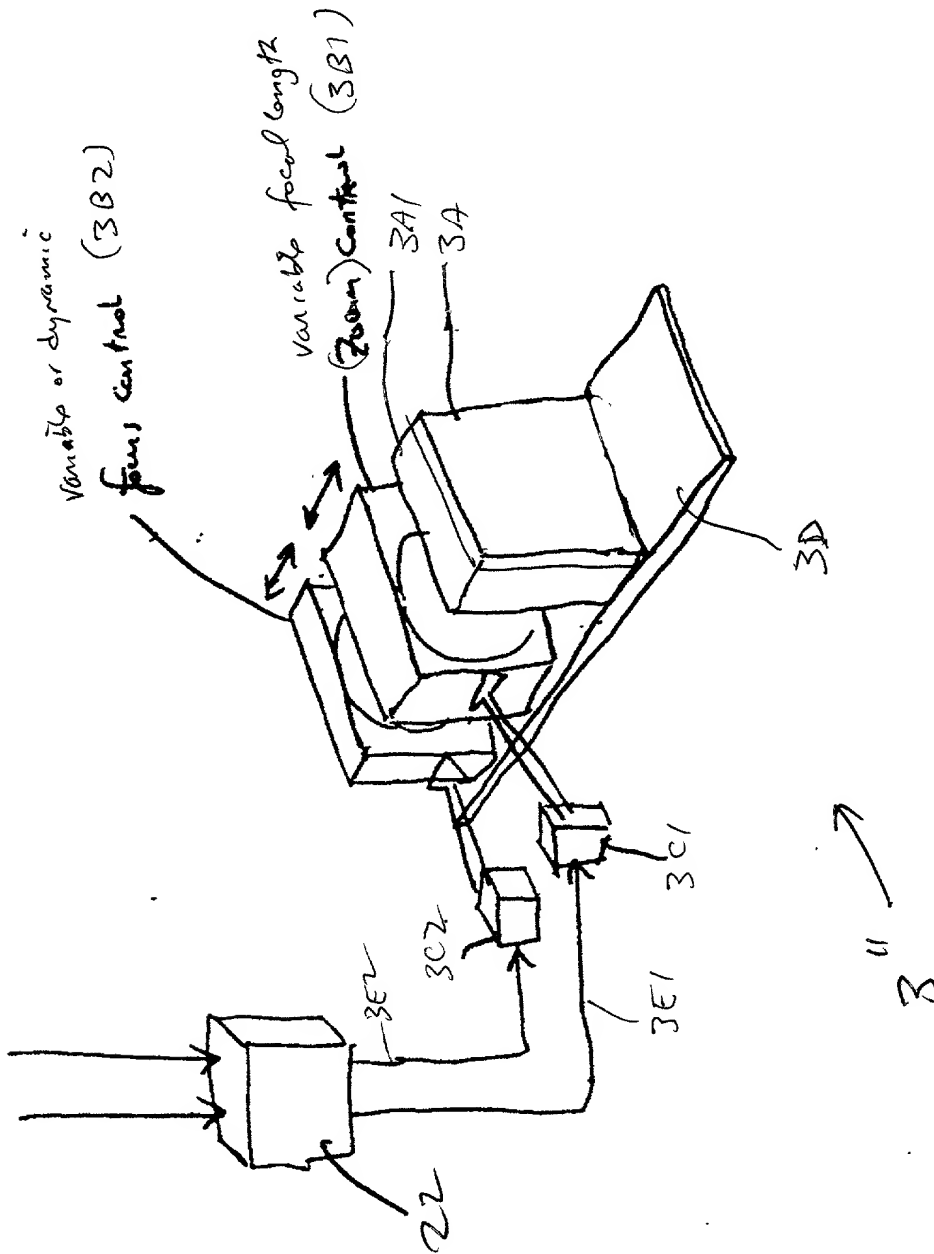


FIG. 354

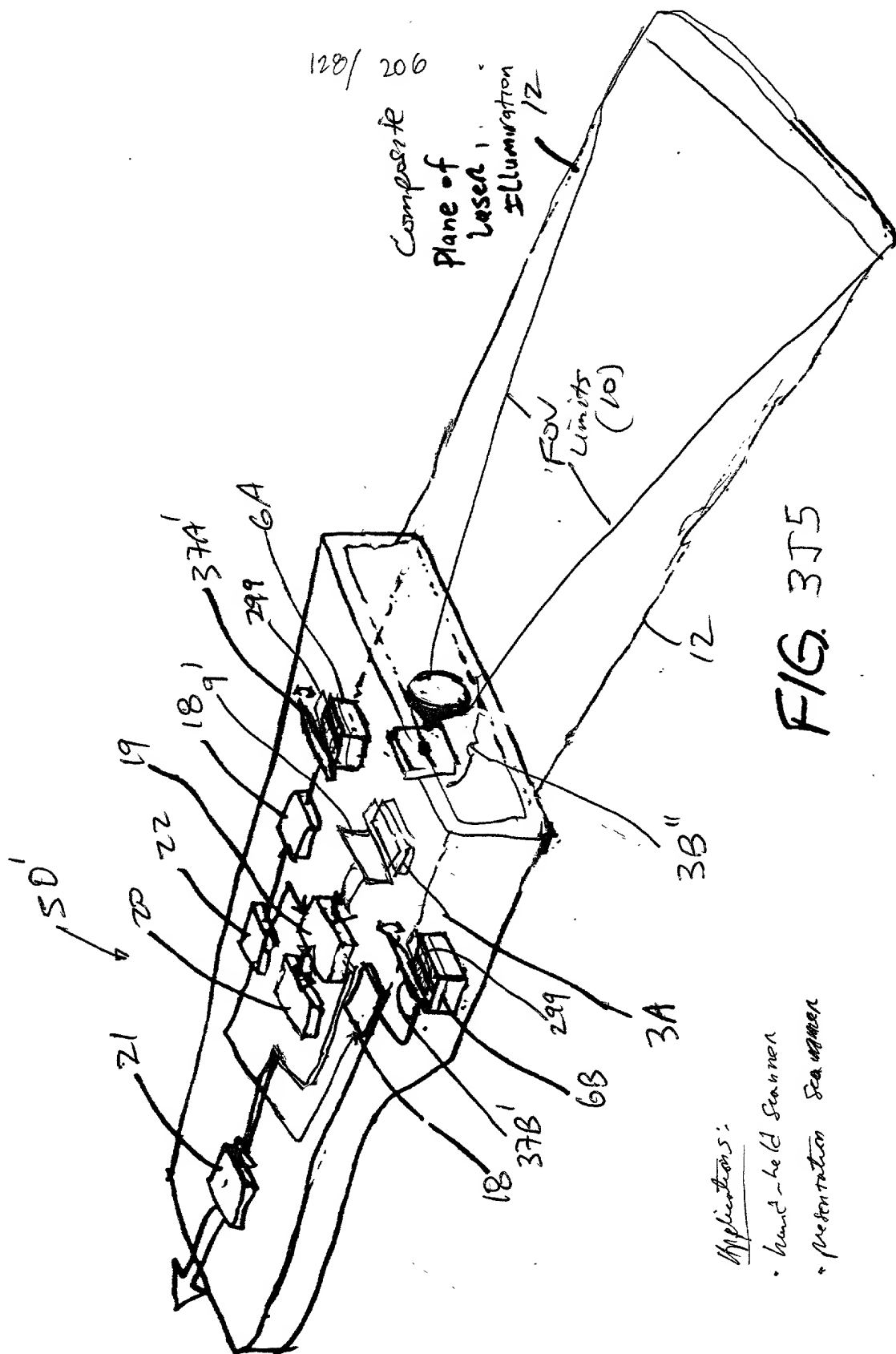
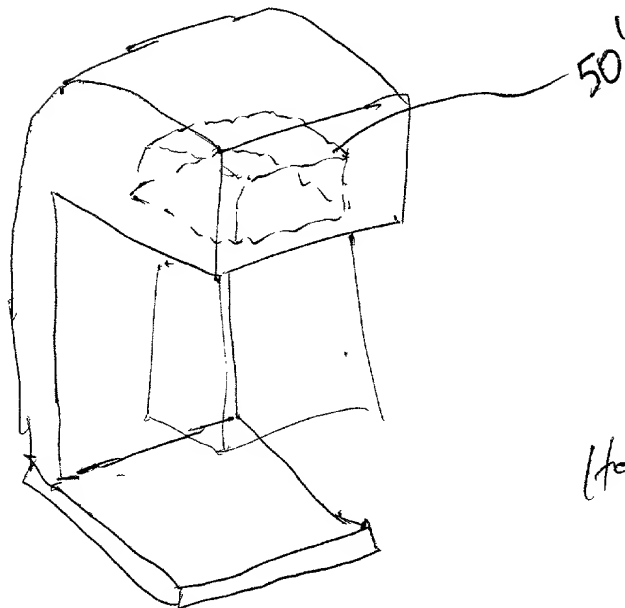


FIG. 3T5

Applications:

- hand-held scanner
- presentation scanner

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2-D
hold-under
scanner

FIG-3J6

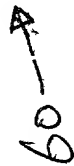


FIG 4A

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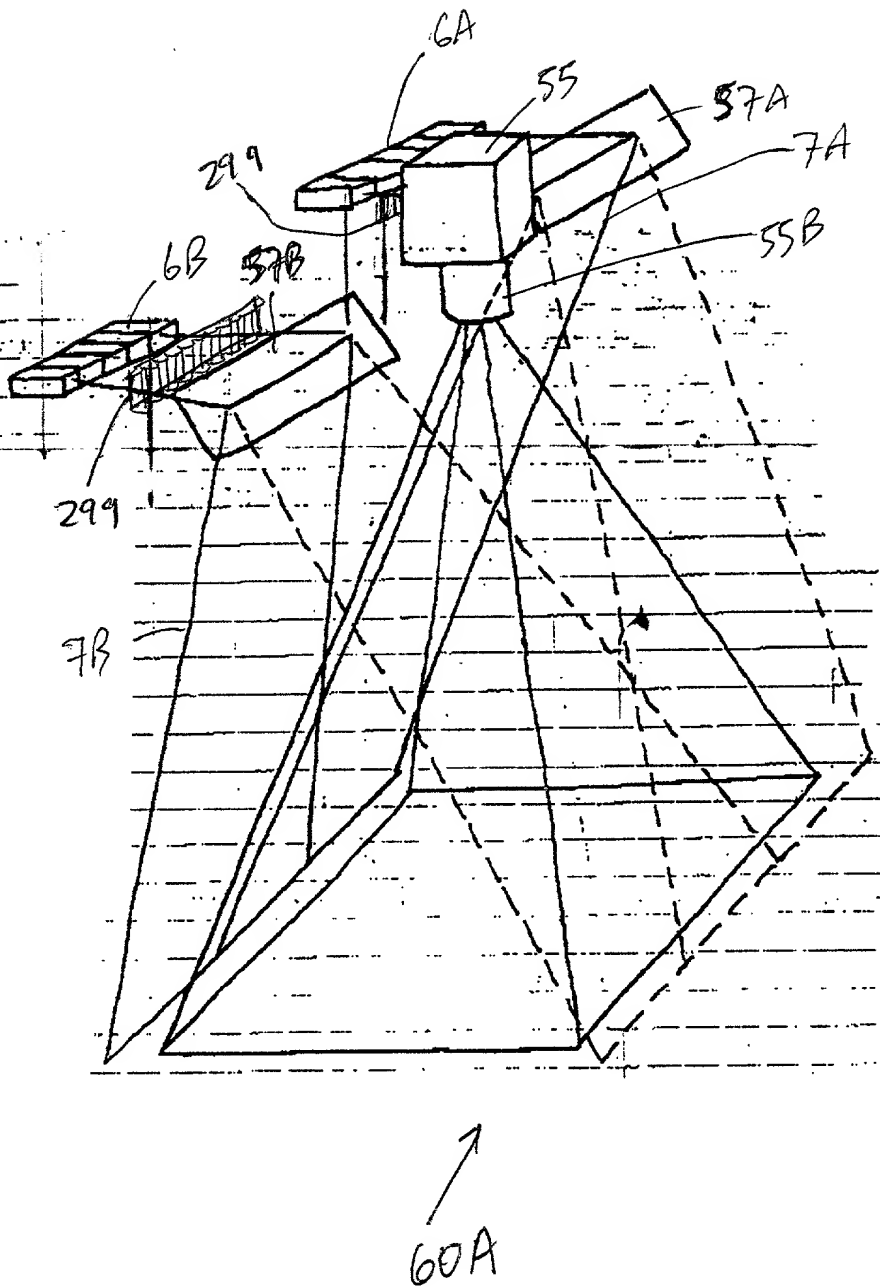
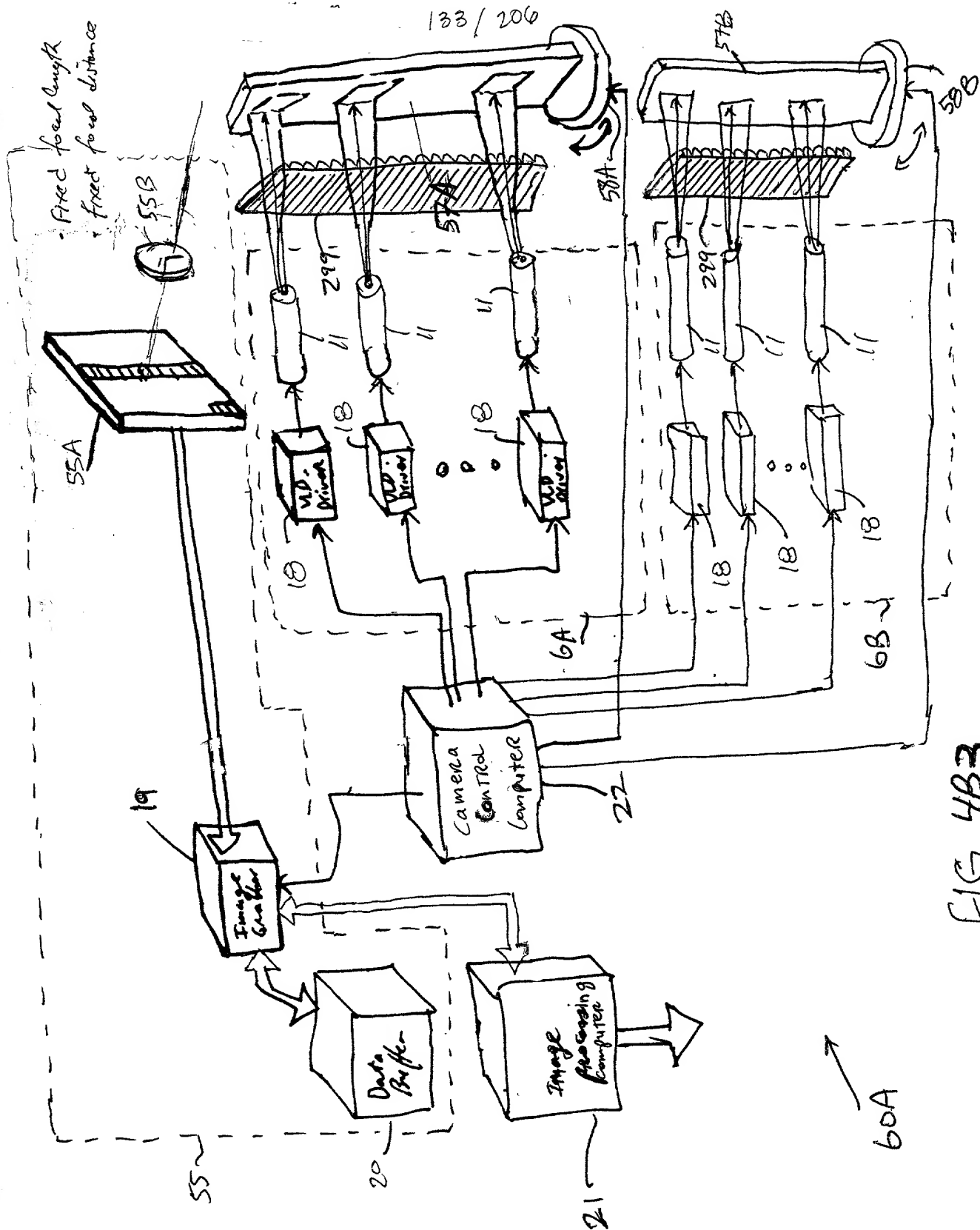


FIG. 4B1



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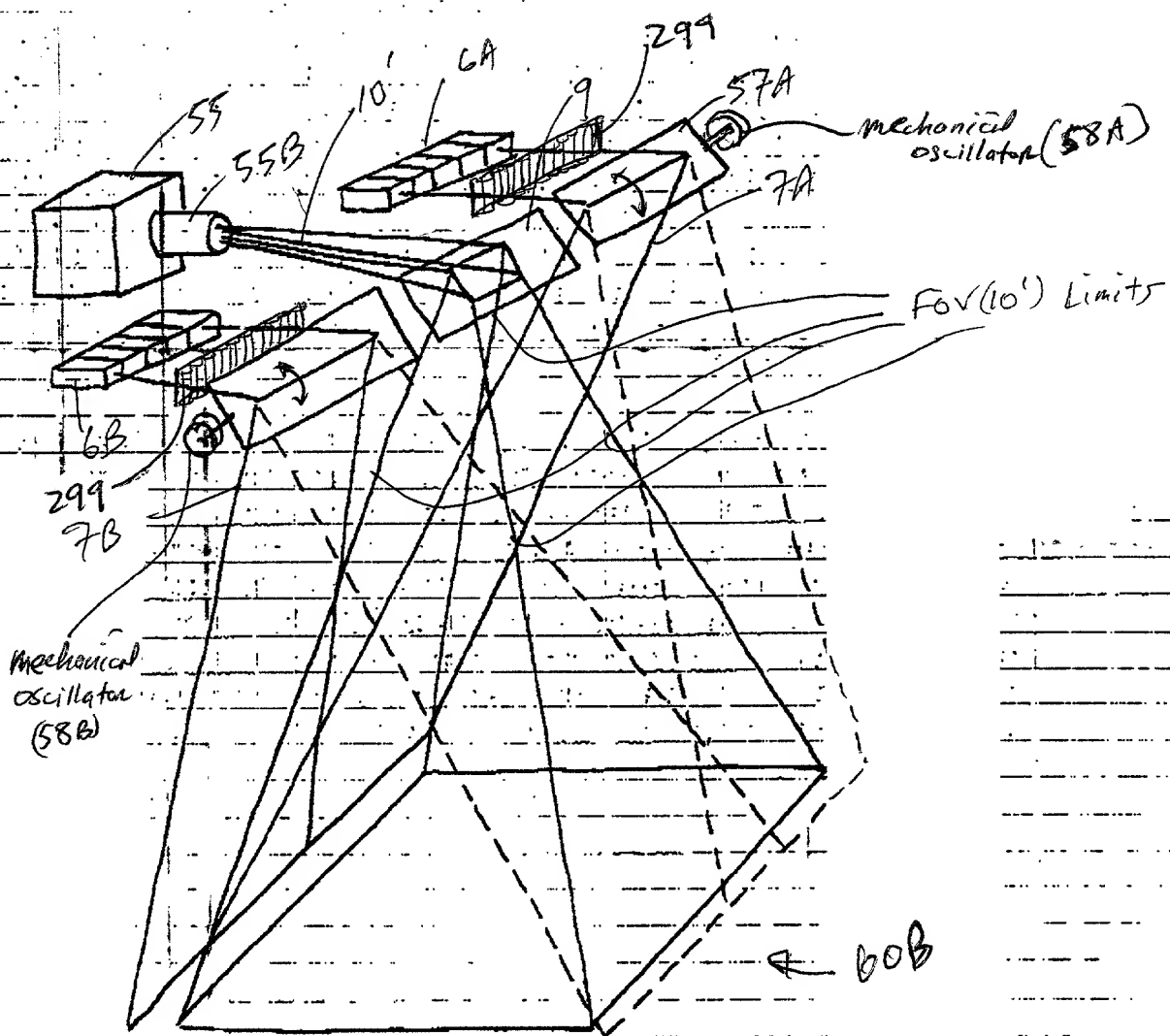


FIG 4C1

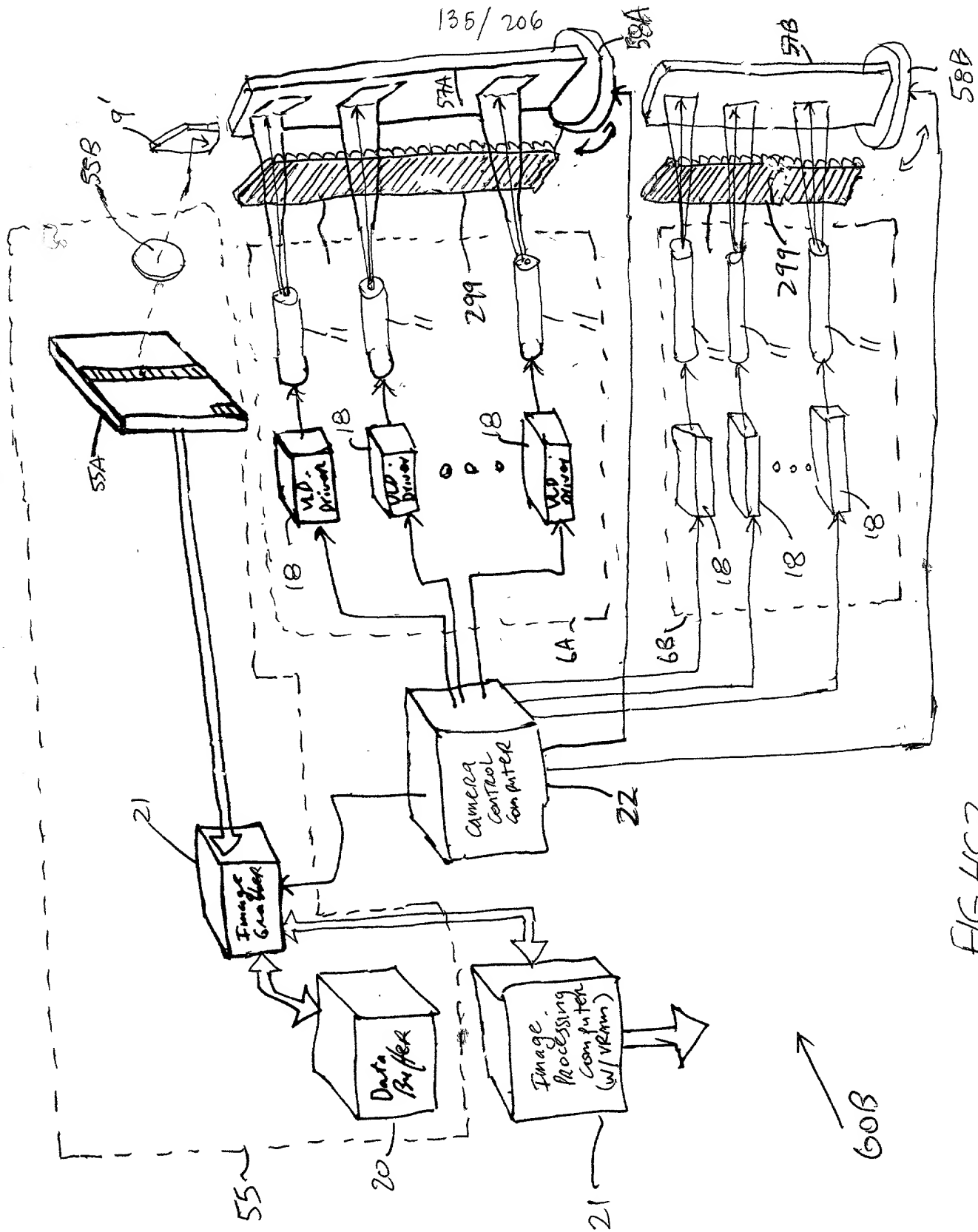


FIG. 4C2

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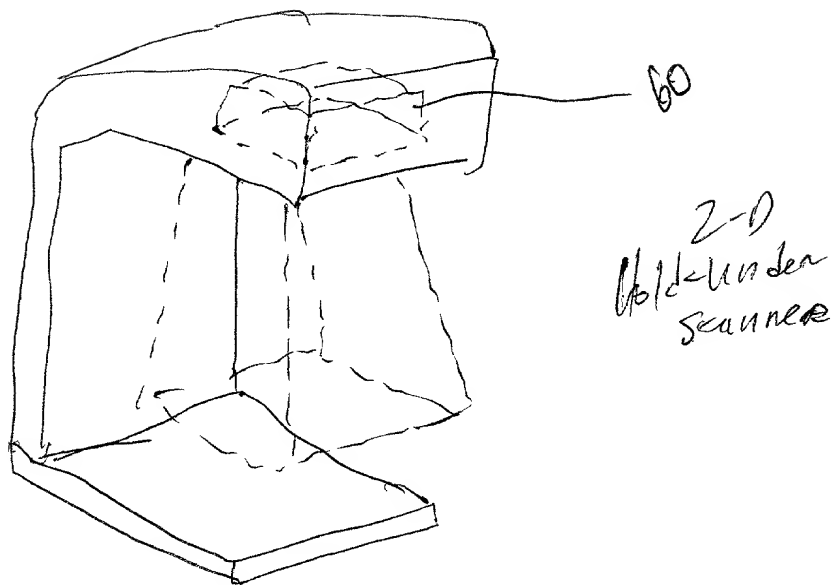


FIG. 4D

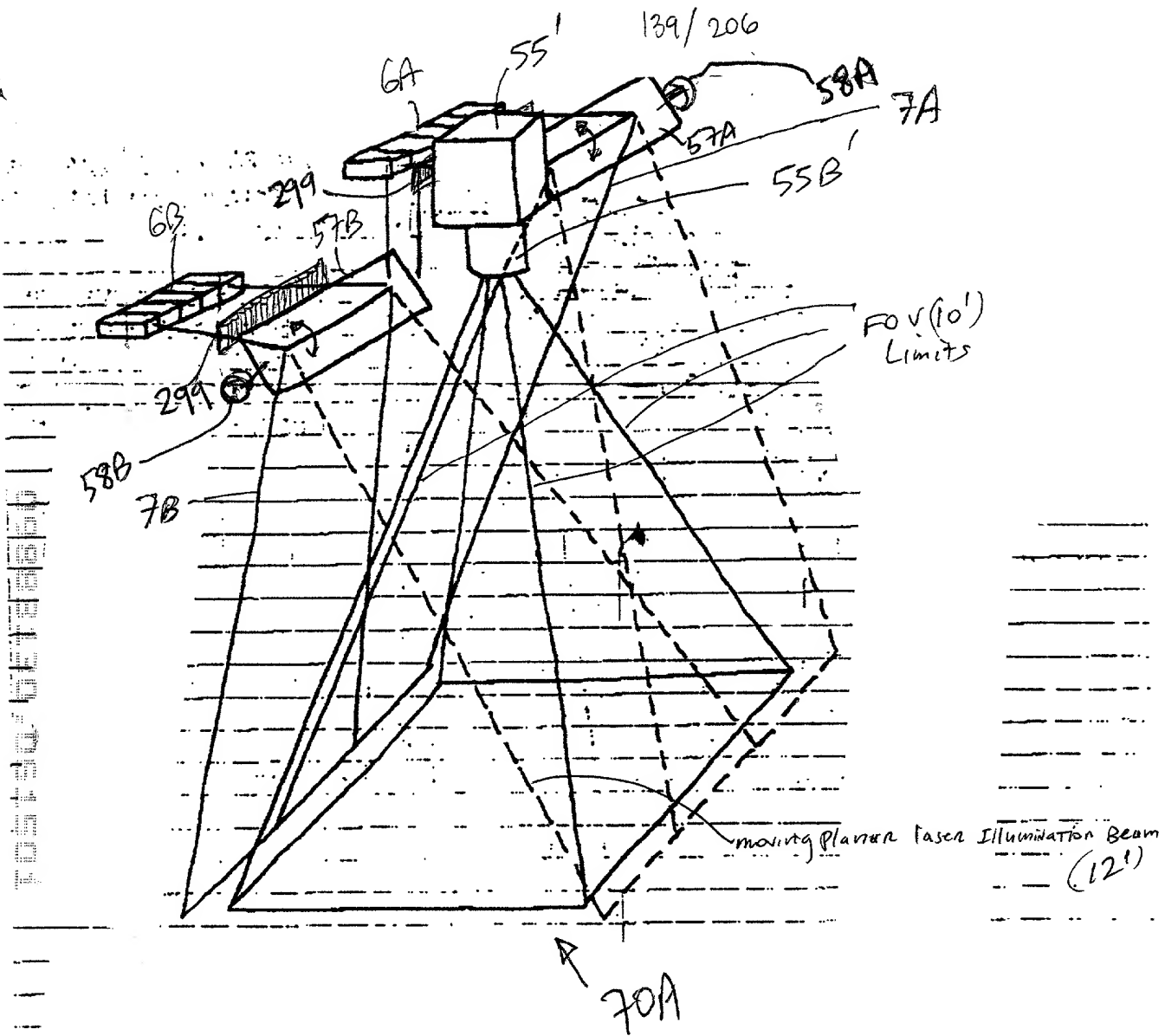


FIG 5B1

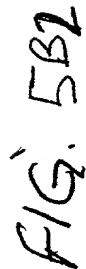
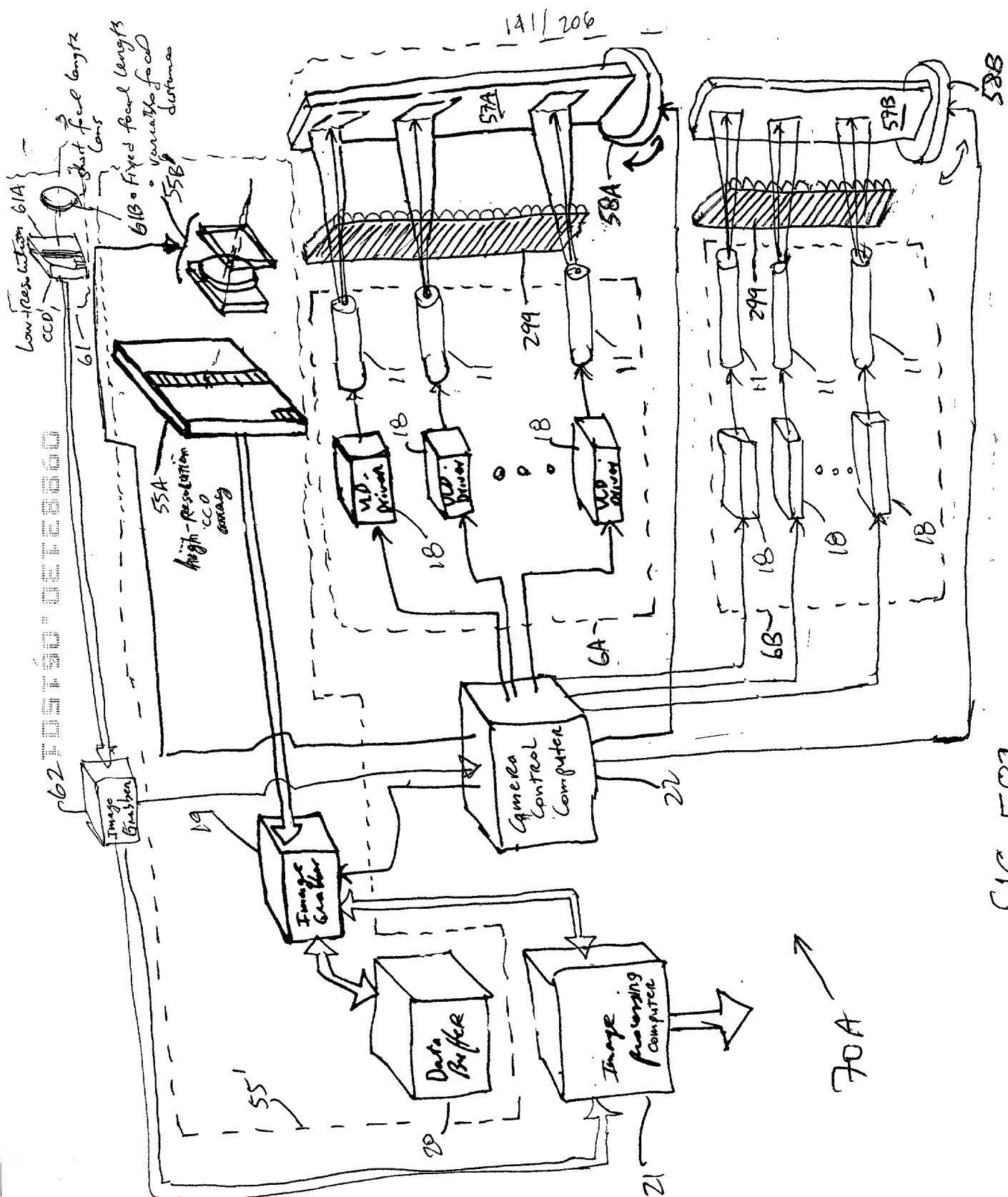


FIG. 5B2



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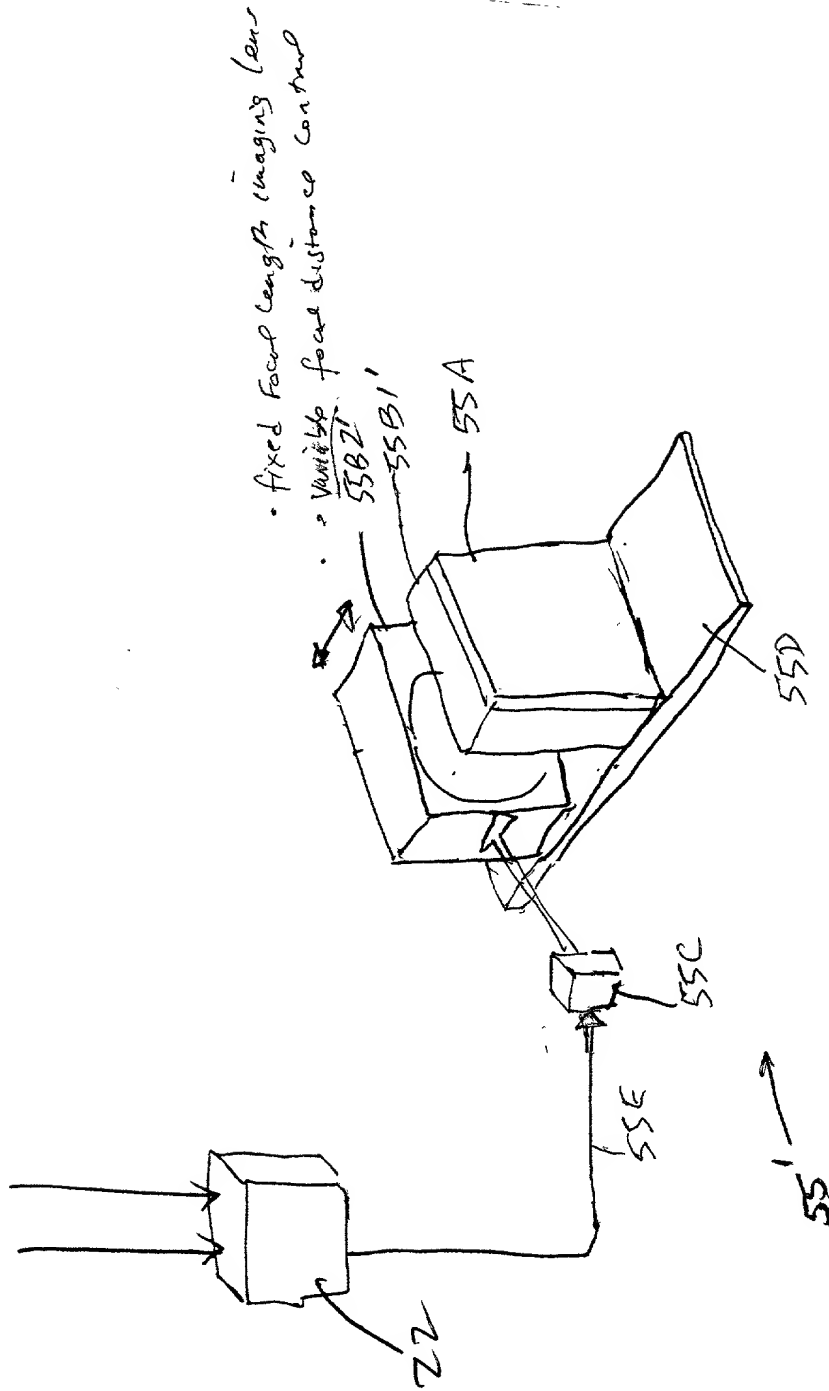


FIG. 5B4

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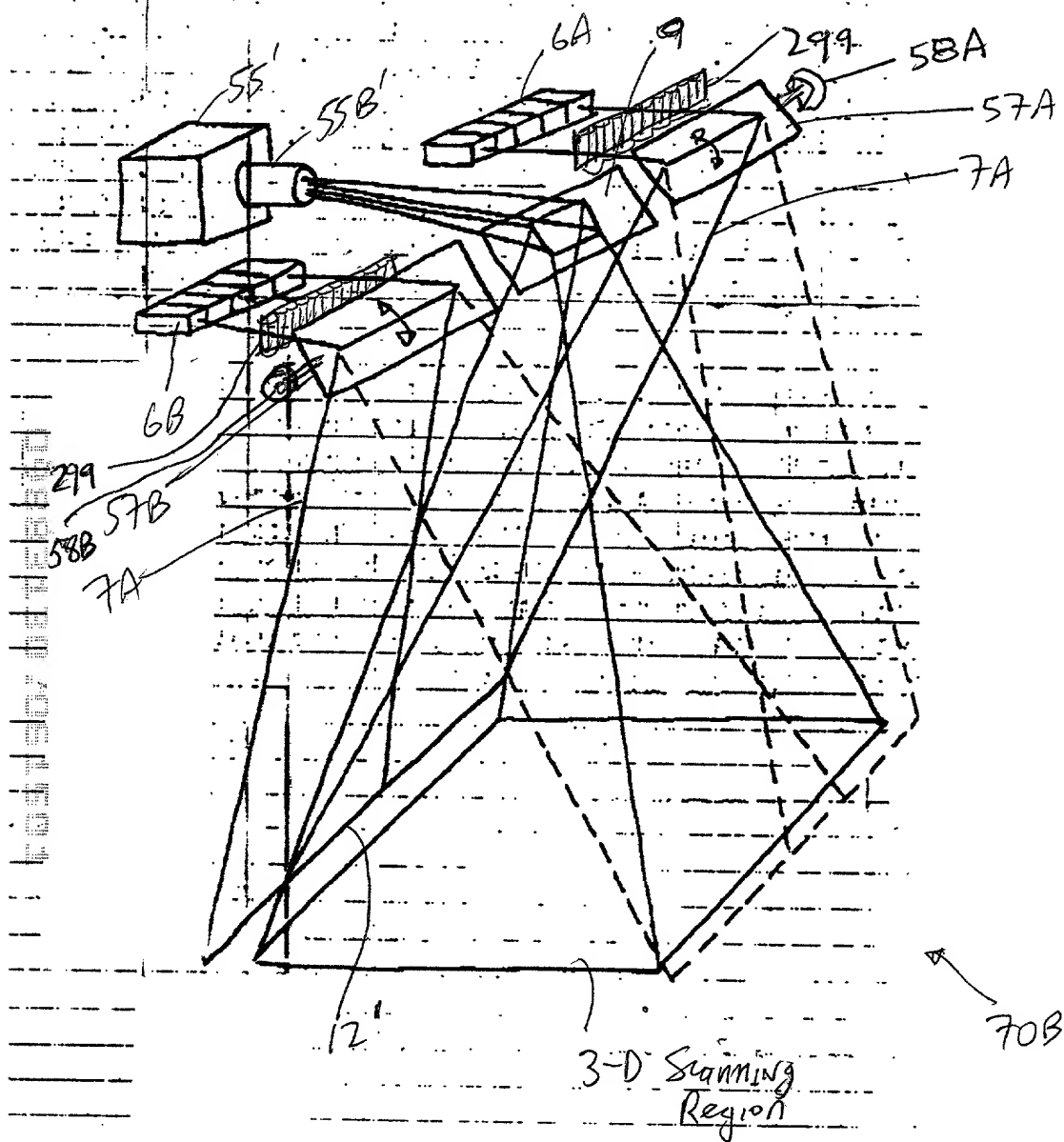
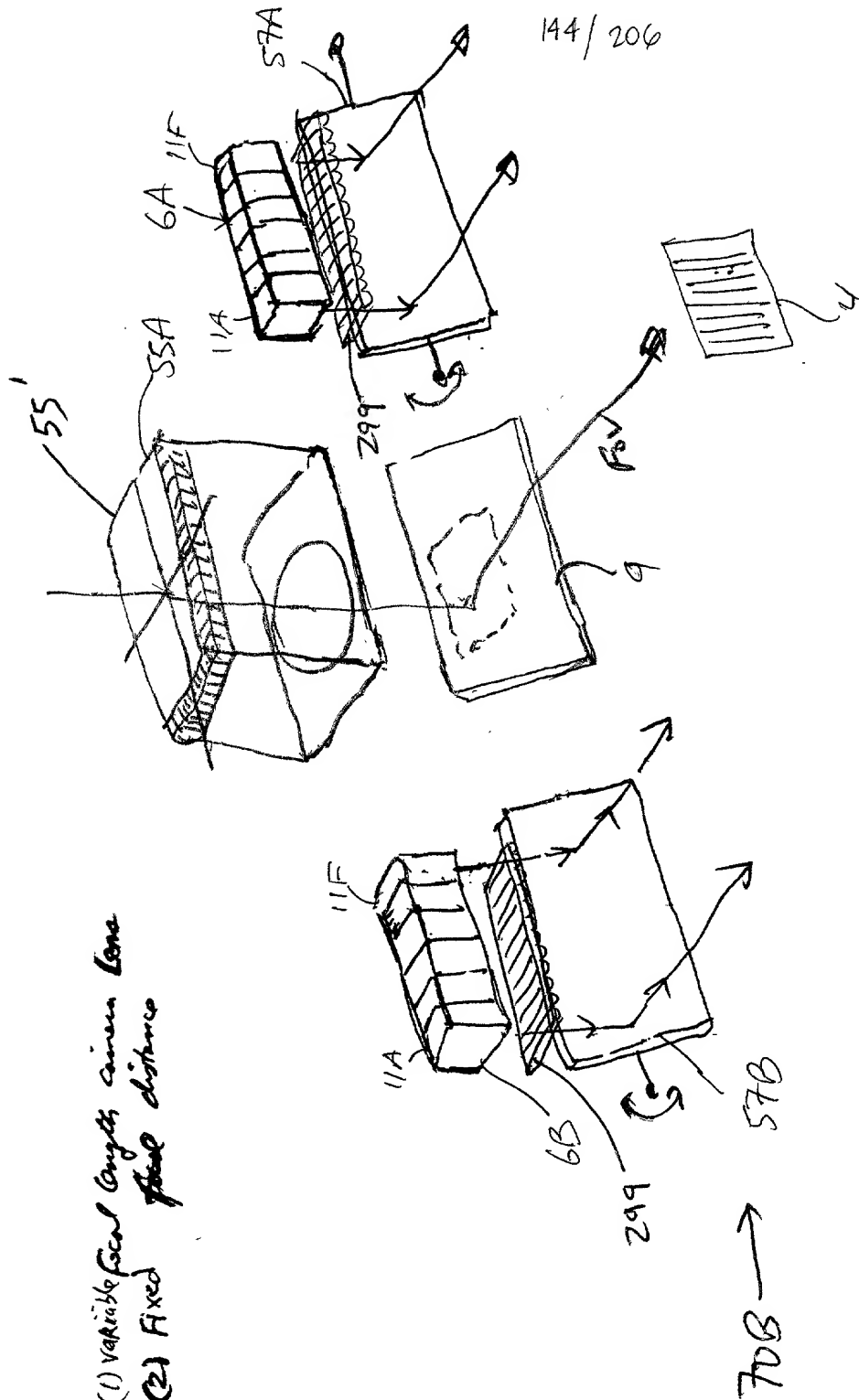


FIG. 5C1

(1) Variable focal length camera lens
(2) Fixed focal distance



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FIG. 5C

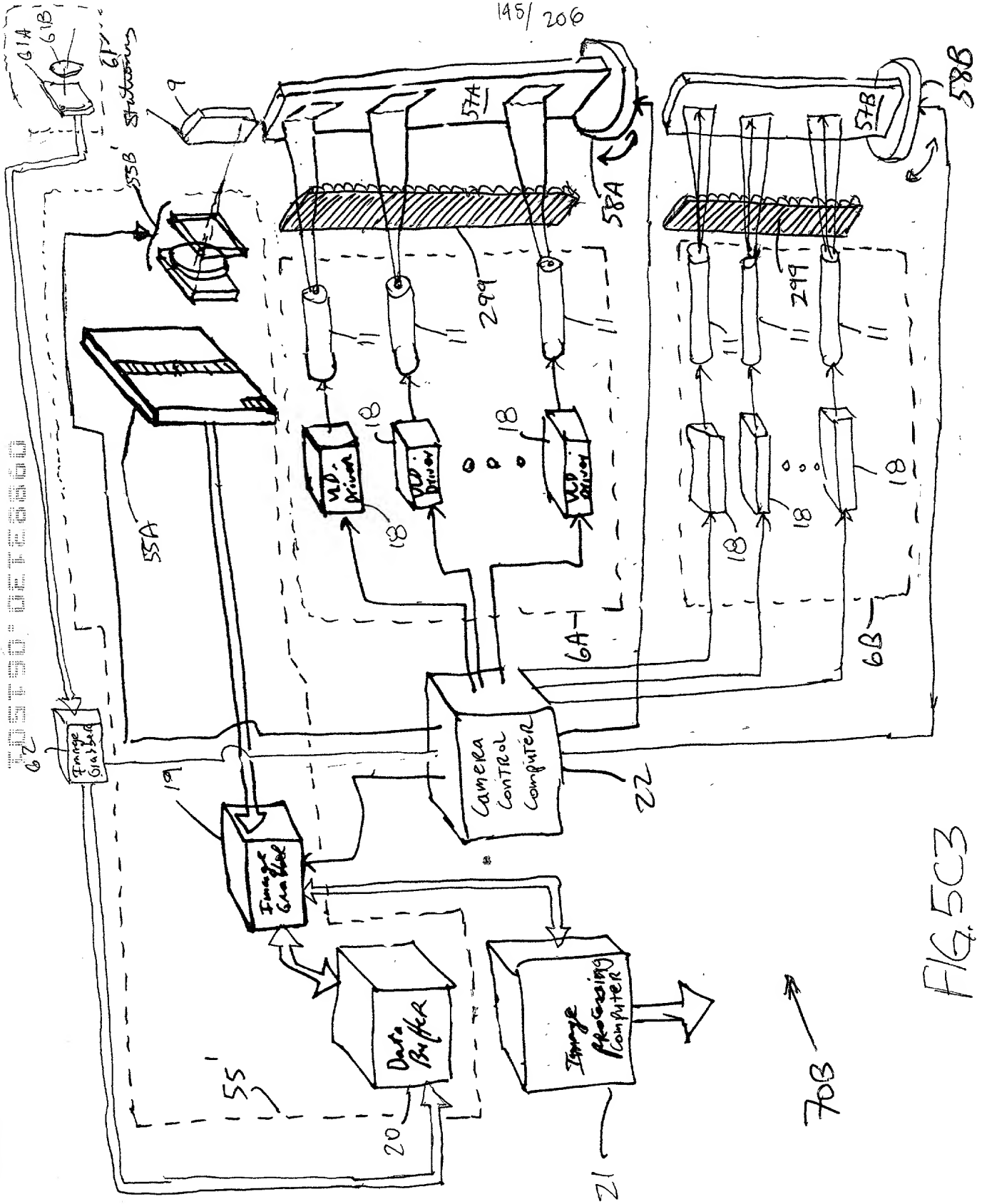


FIG. 5C3

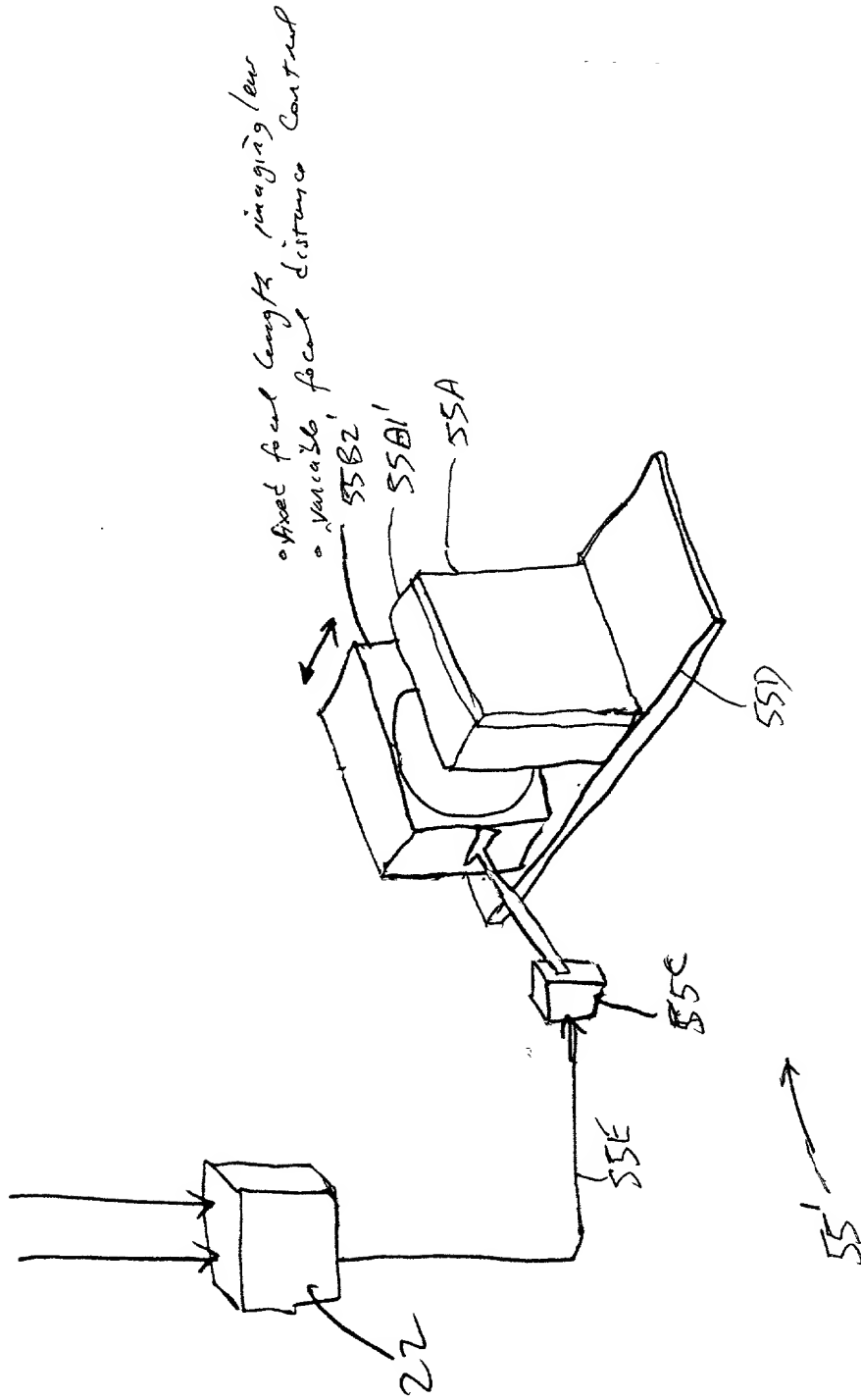


FIG. 5C4

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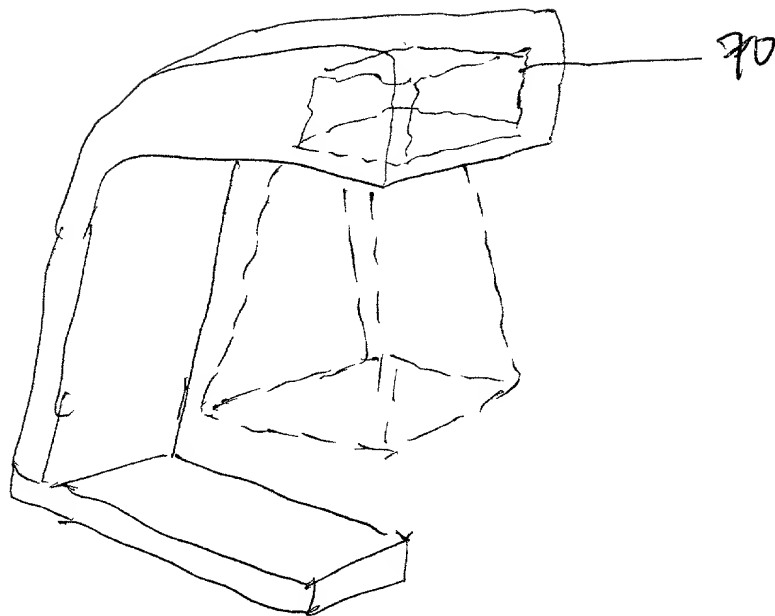


FIG 5D

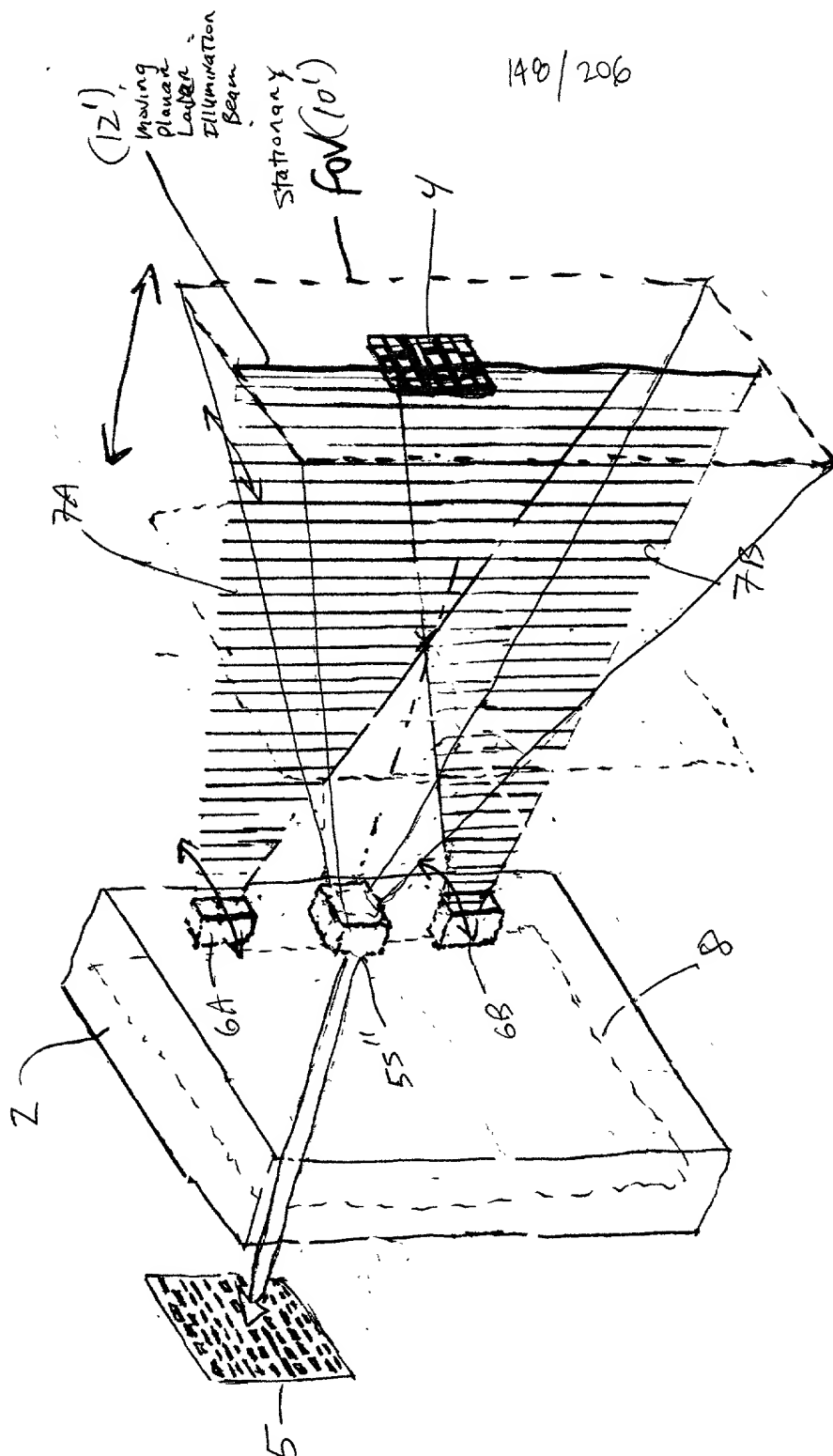


FIG. 6A

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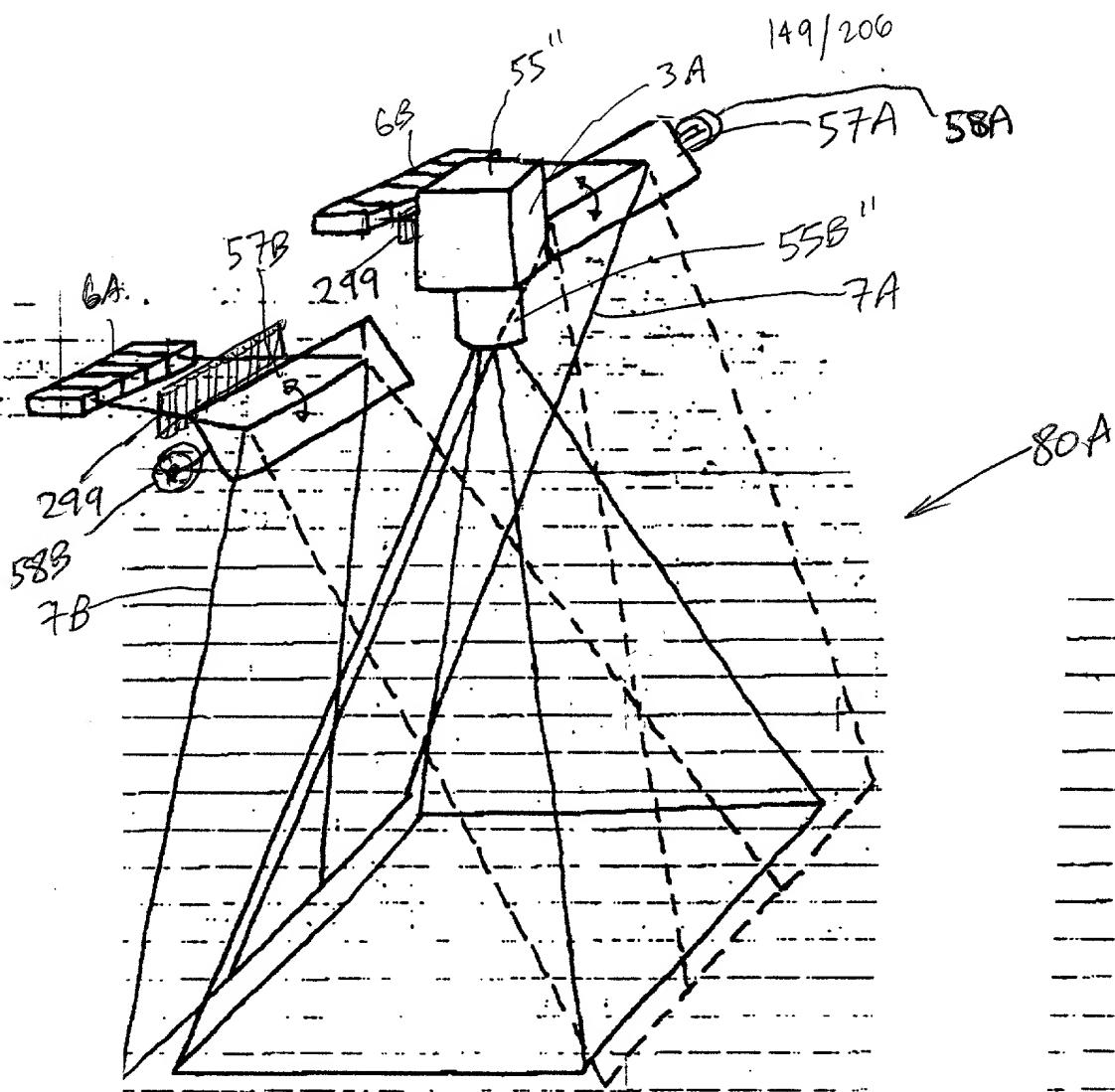


FIG. 6B1



FIG. 6B2

FIG. 6B3

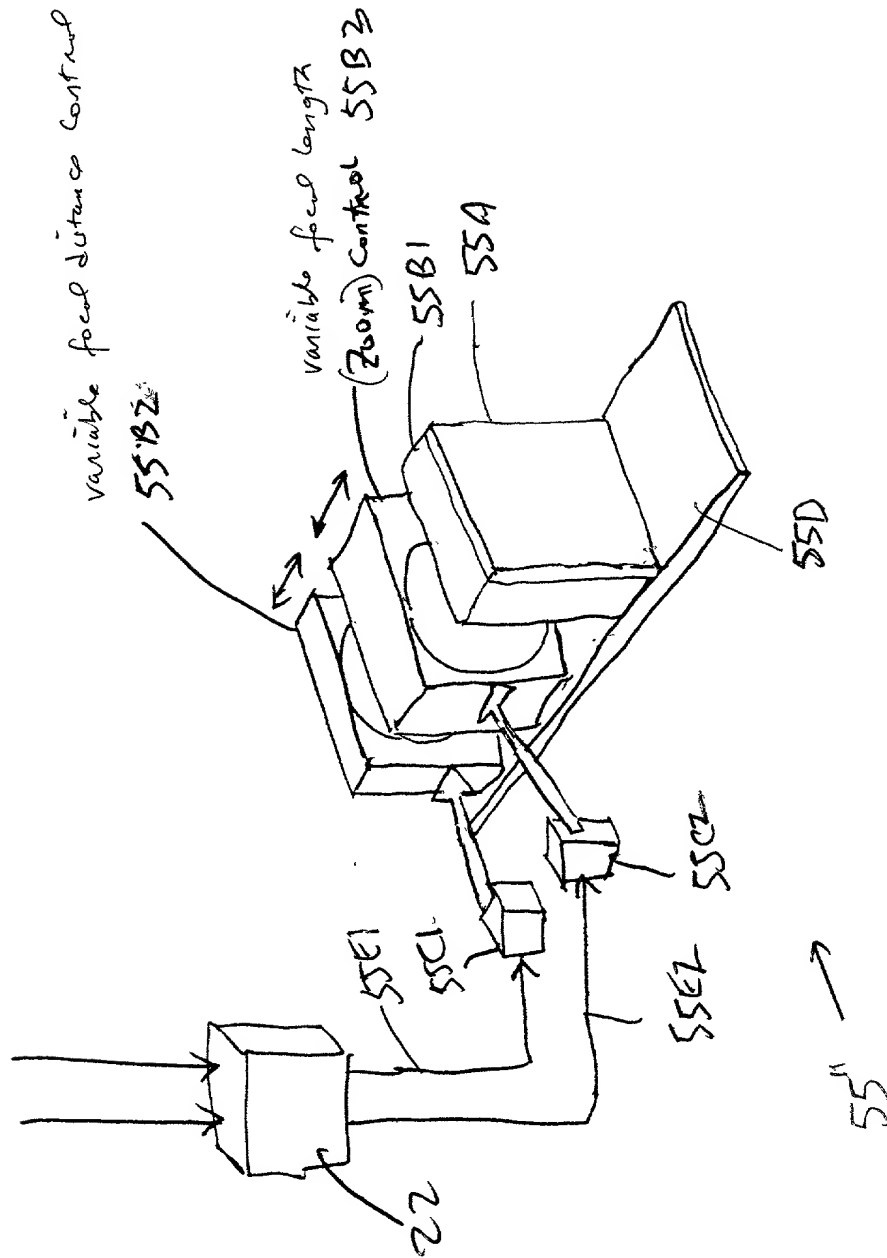
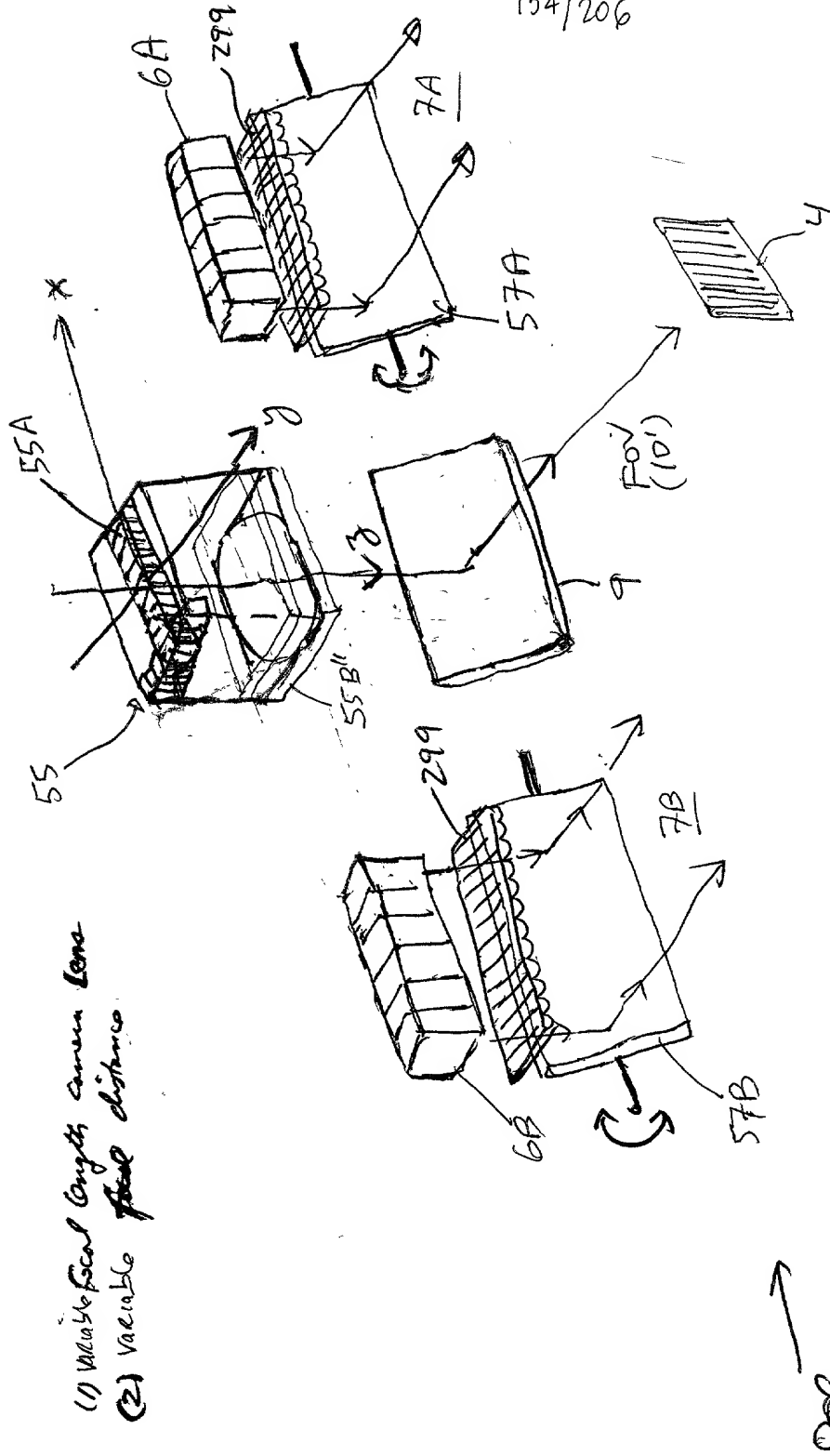


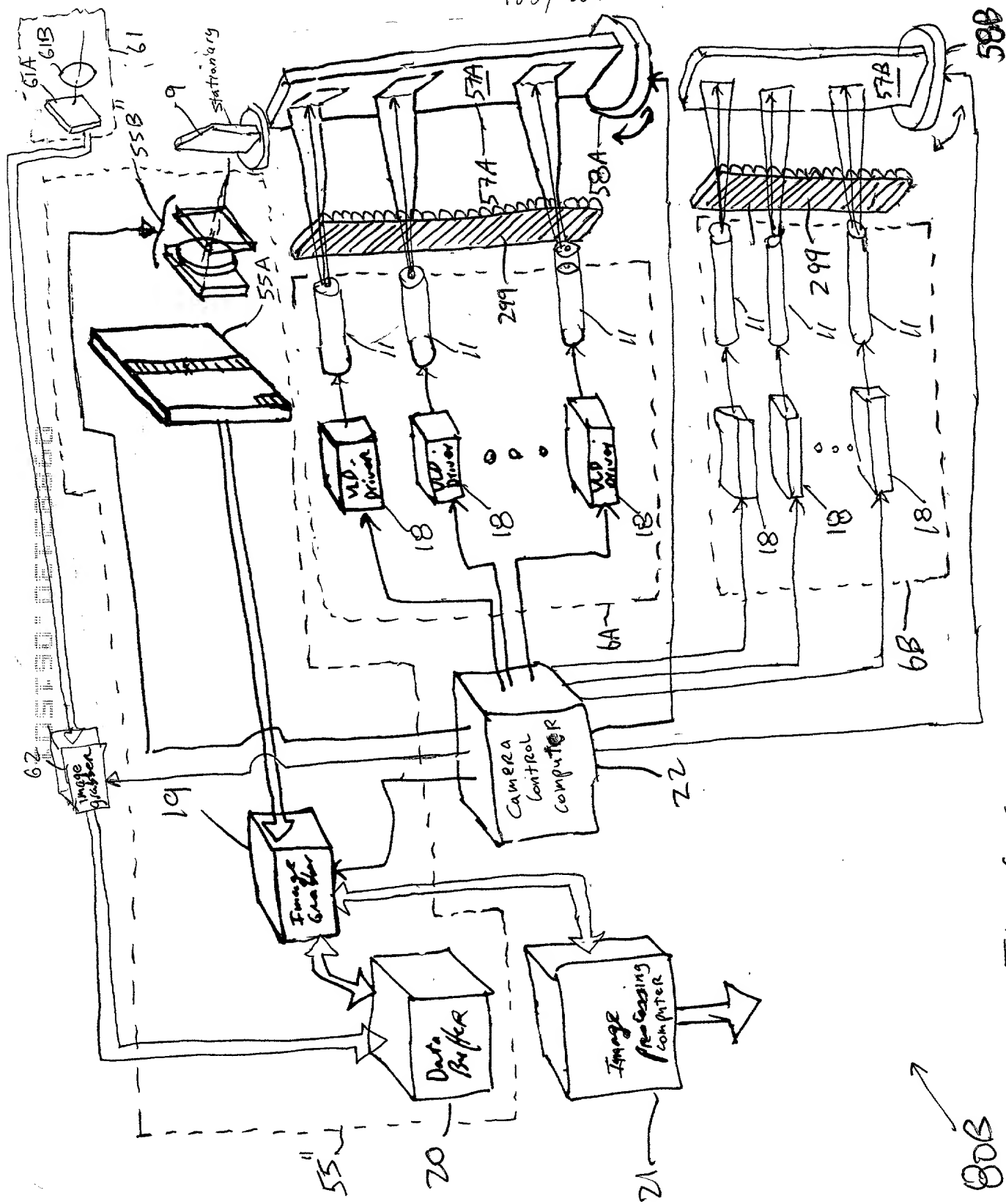
FIG. 6B4

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- (1) Variable focal length, camera lens
- (2) Variable focal distance

FIG. 6C2



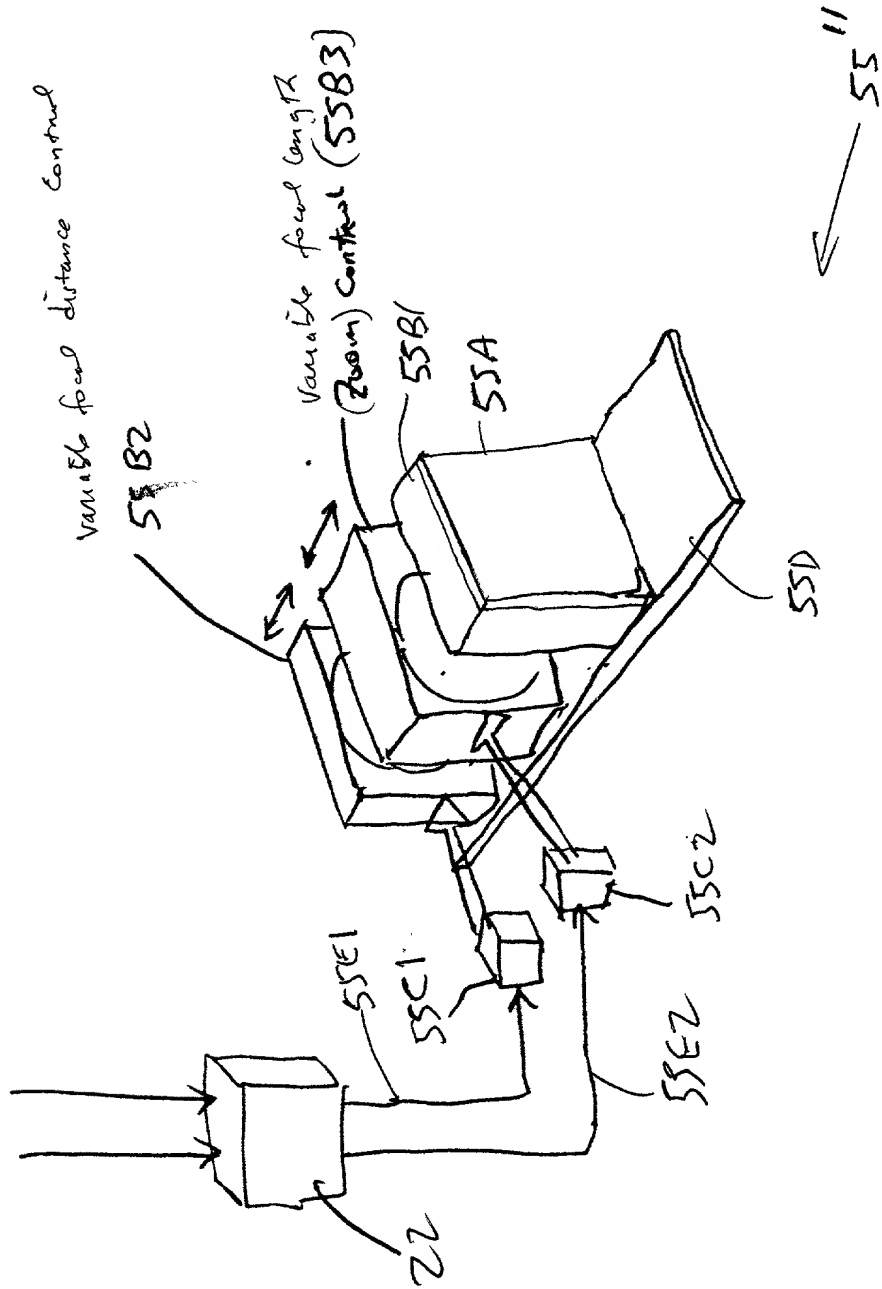


FIG. 6C4

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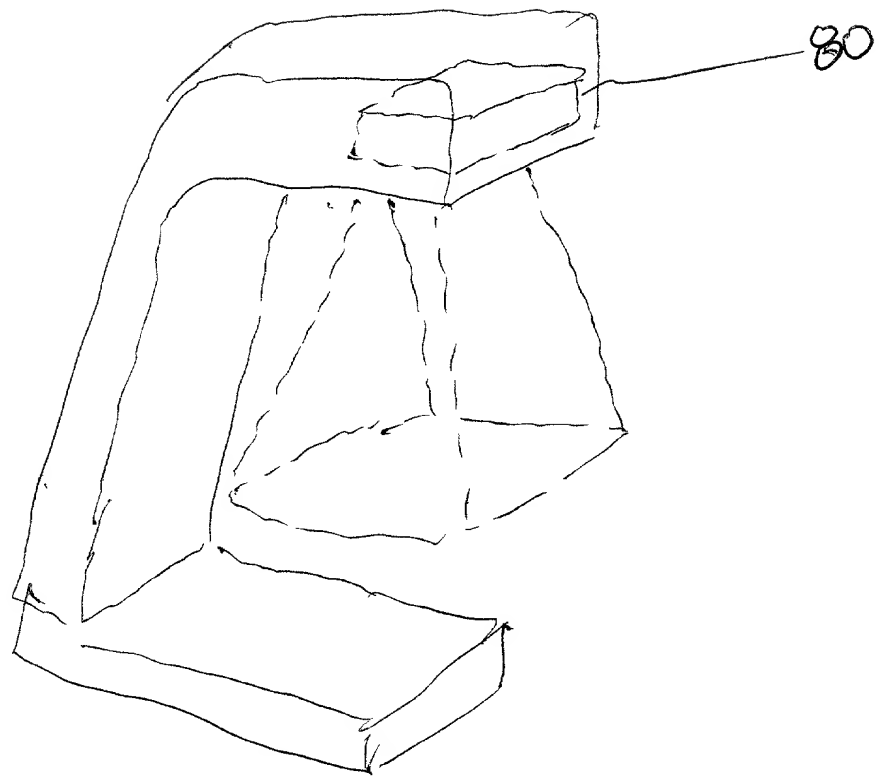
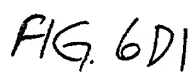


FIG. 6C5

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																				



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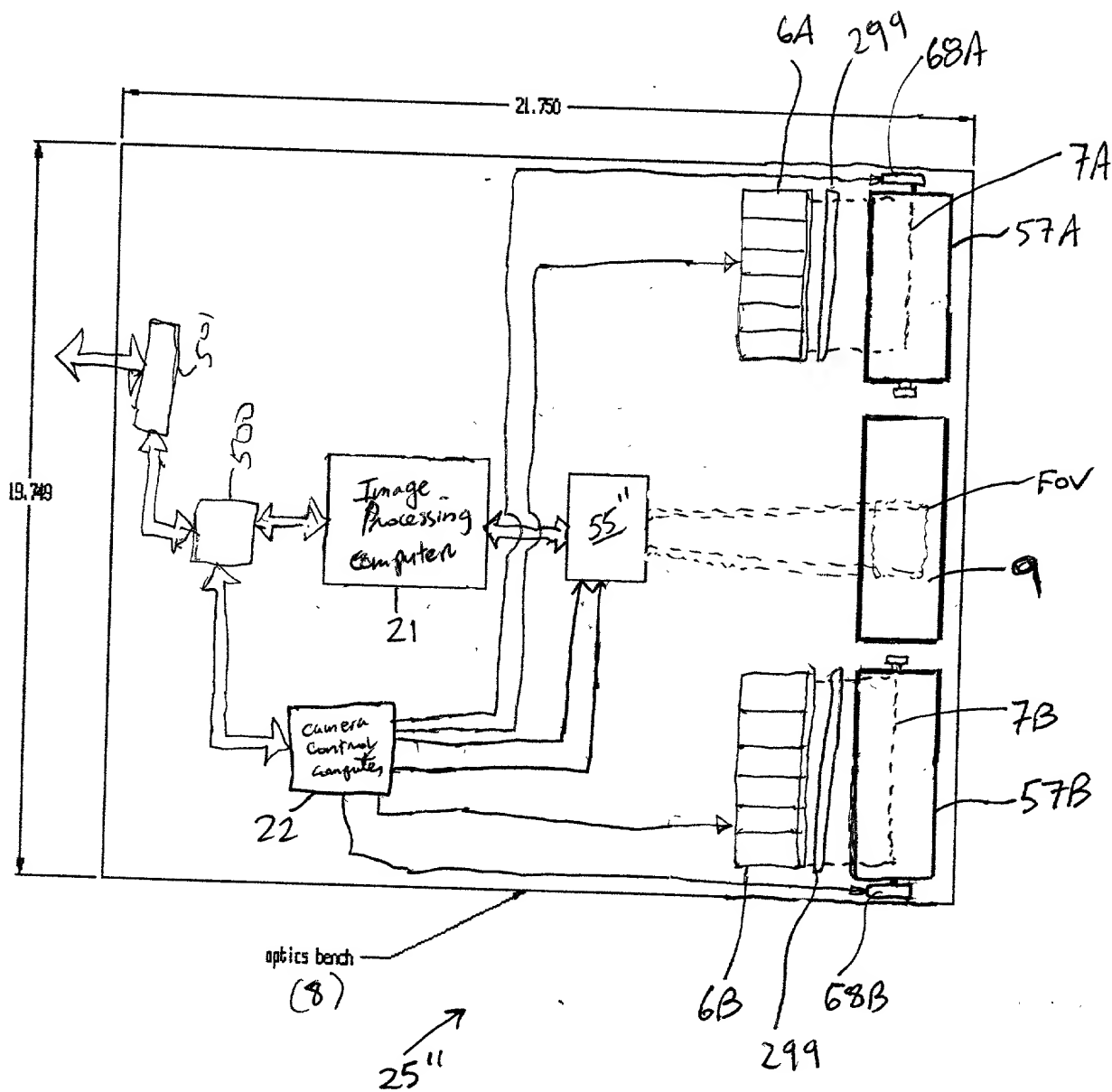
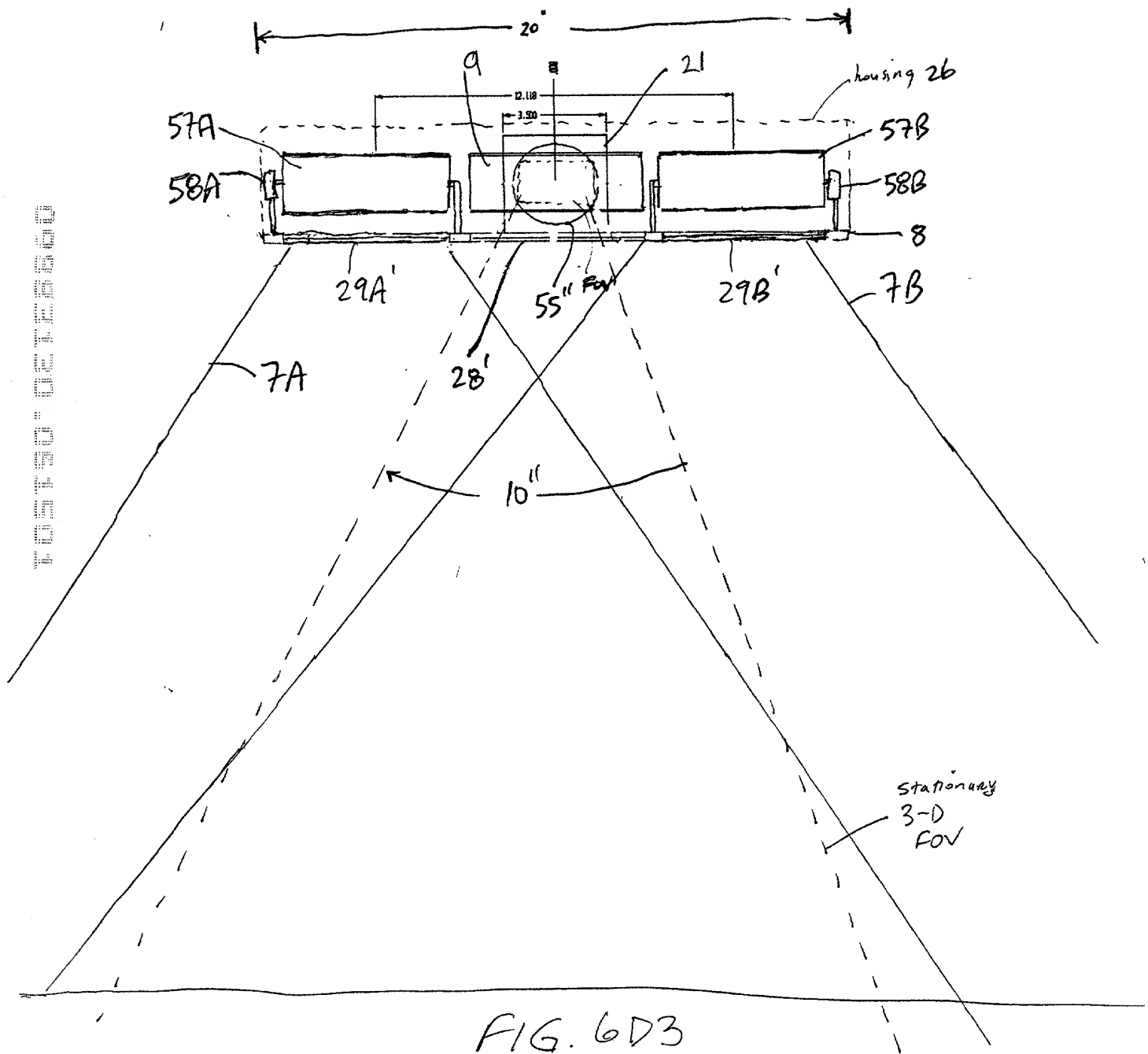


FIG. 6D2

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109430" 06120600

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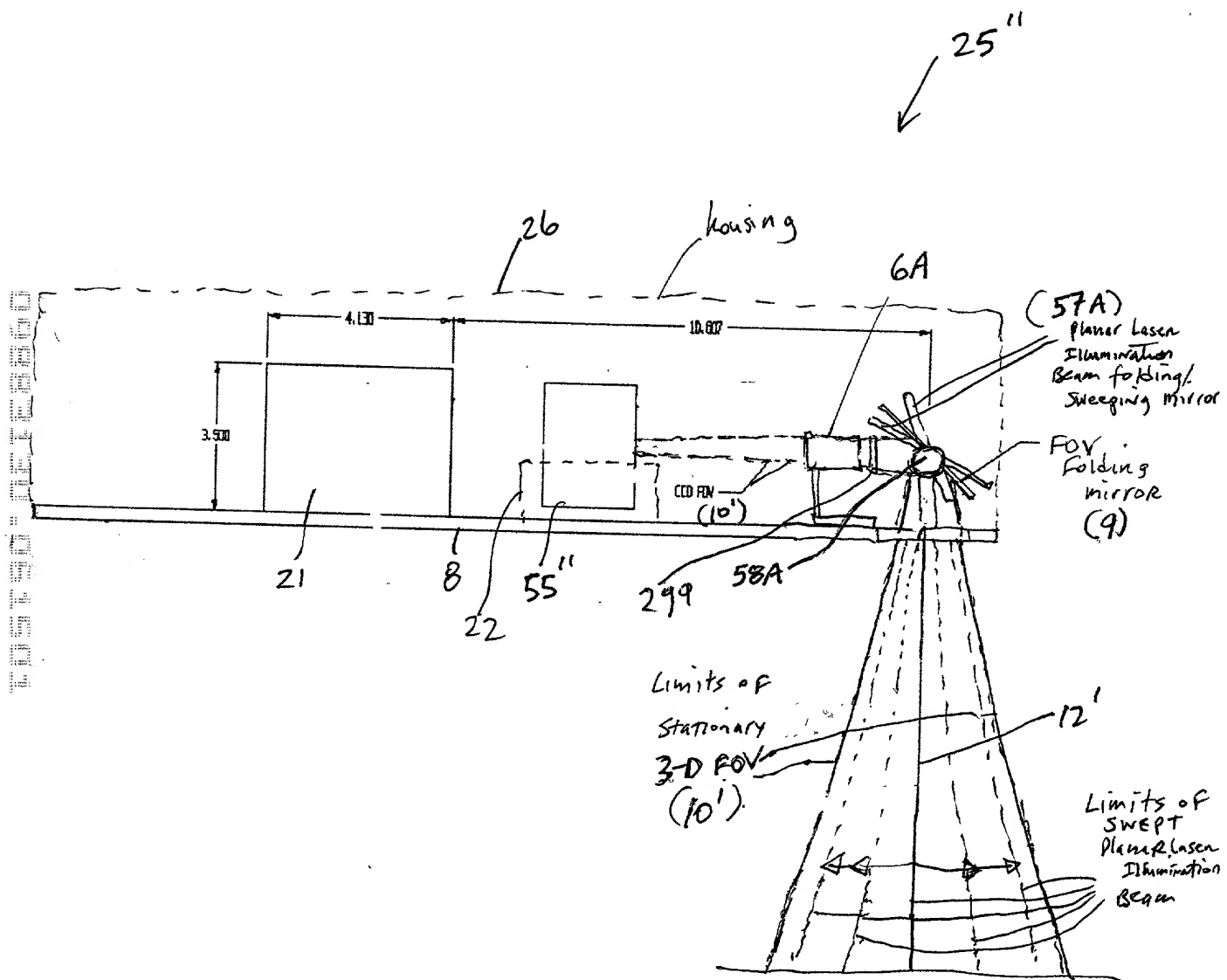


FIG. 6D4

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variable FOV

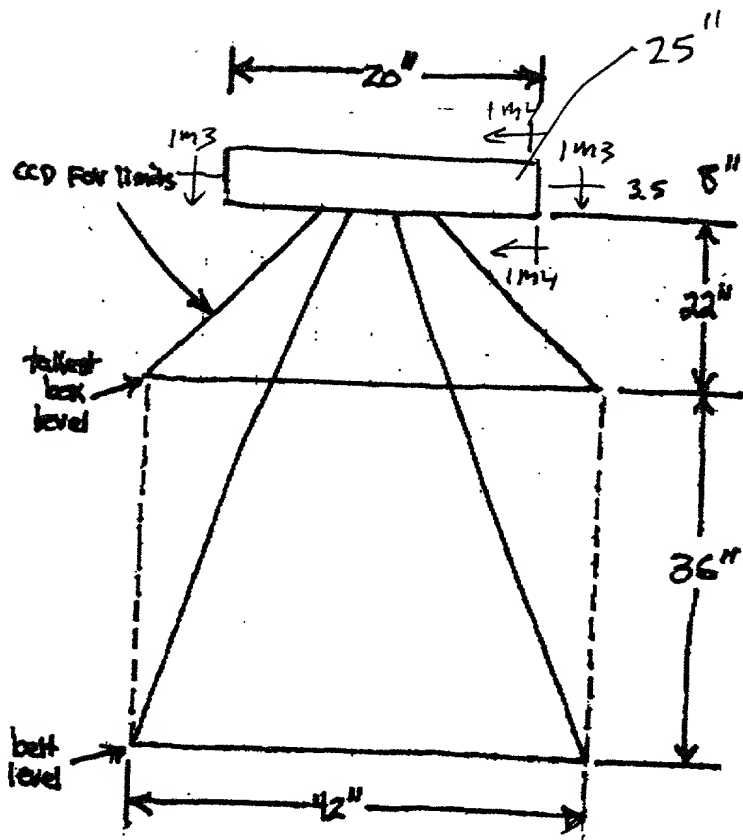


FIG. 6D5

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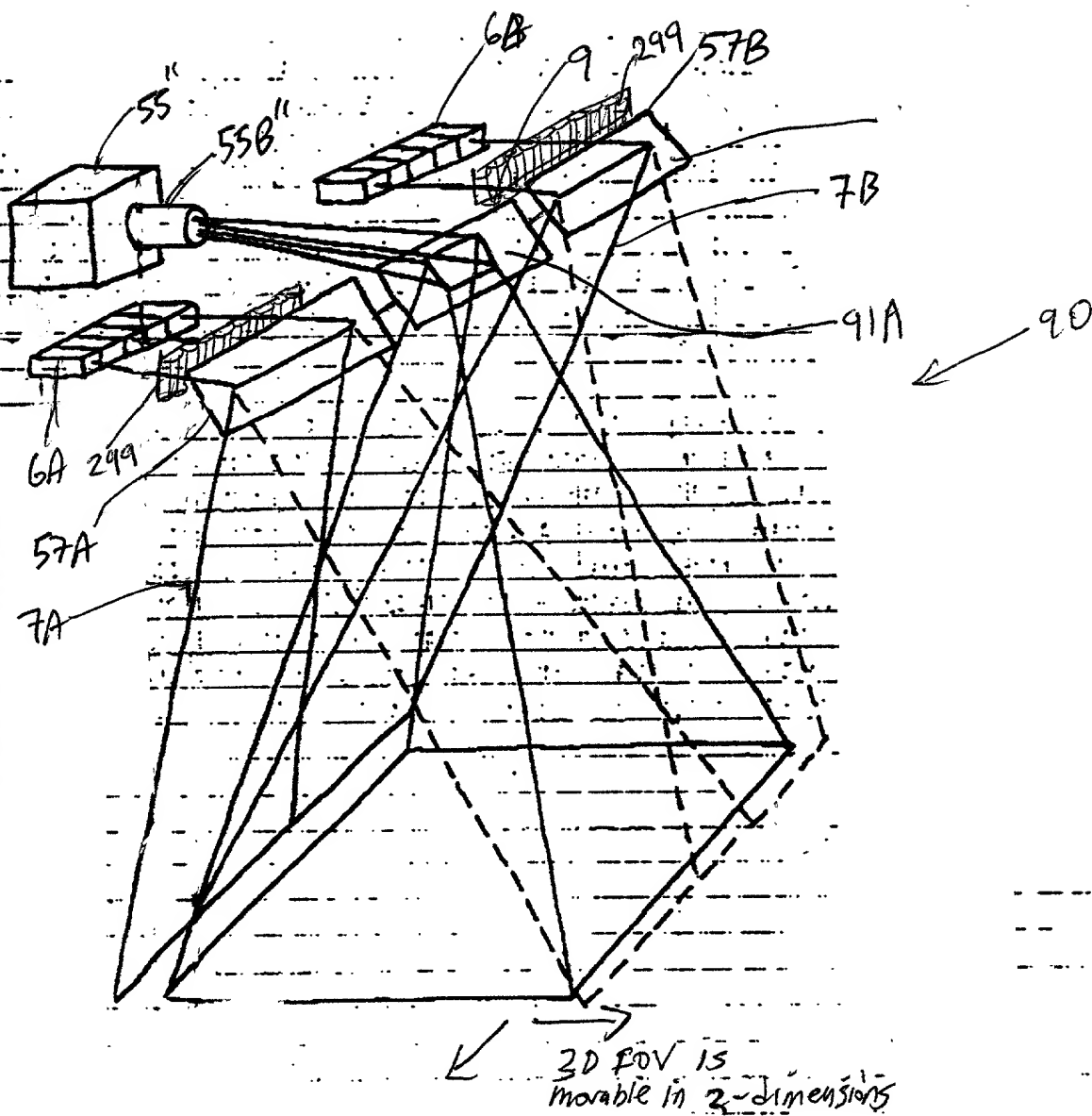
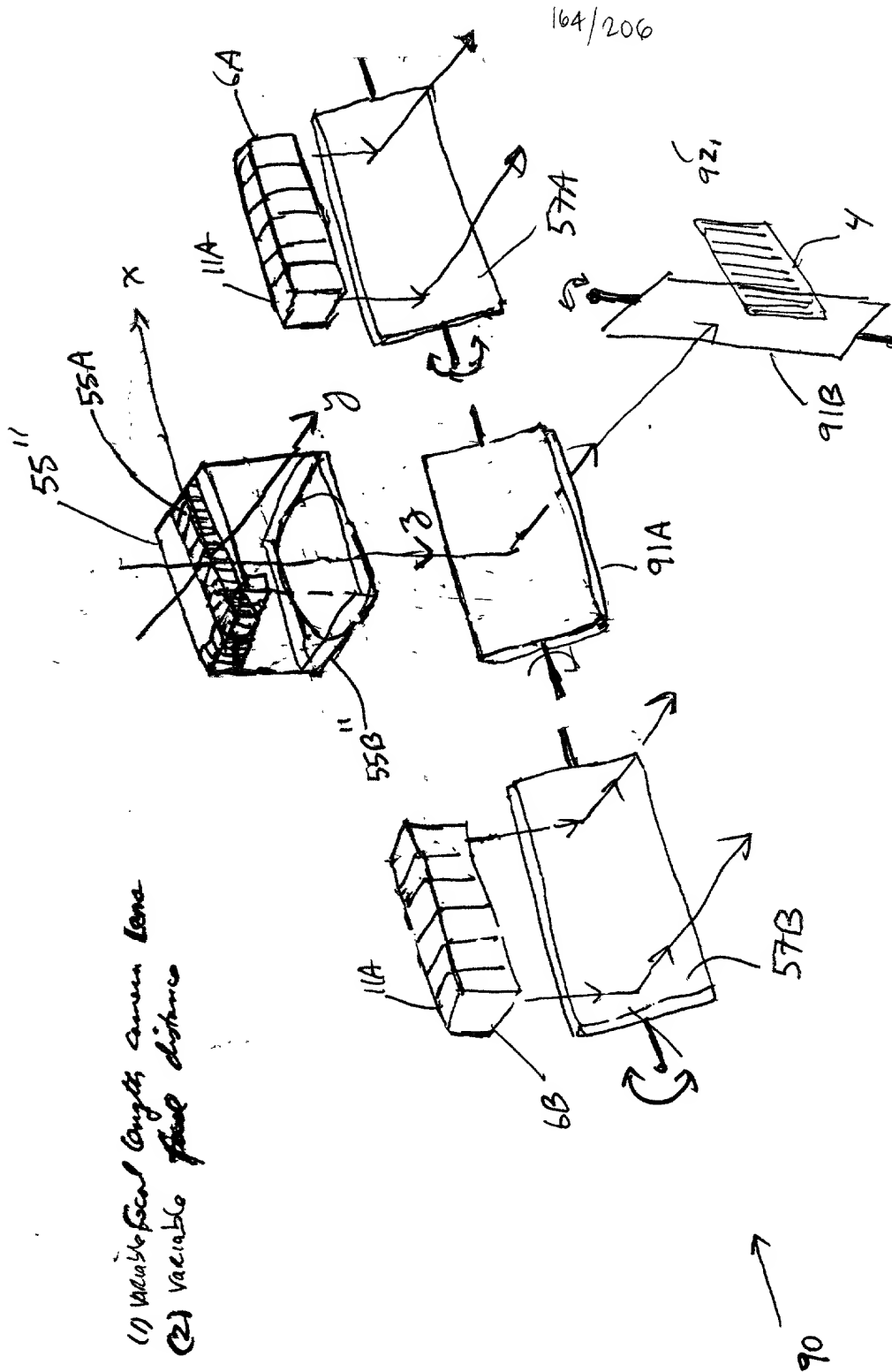


FIG. 6E1



(1) Variable focal length camera lens
(2) Variable fluid distance

FIG. 6E2

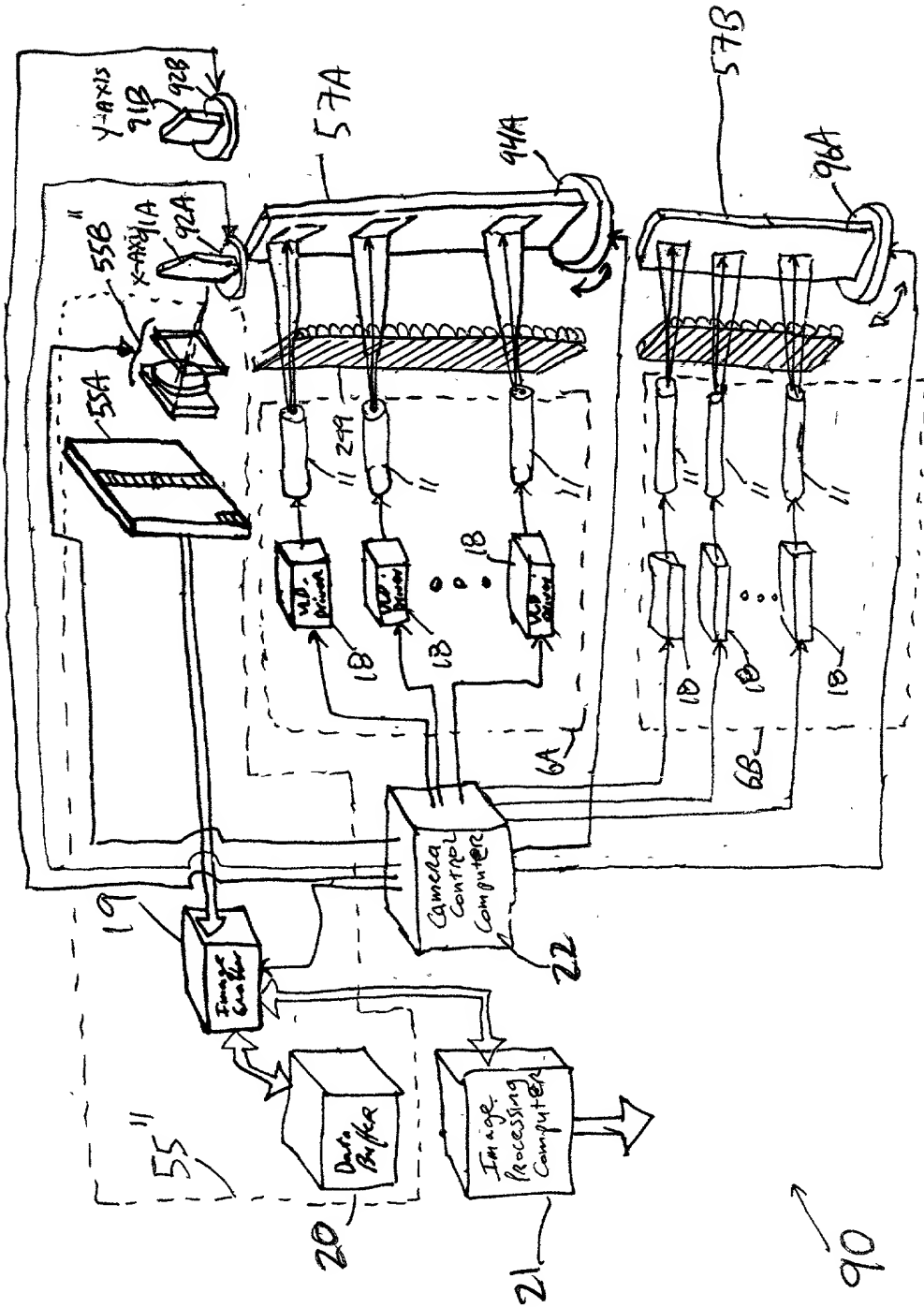


FIG. 6E3

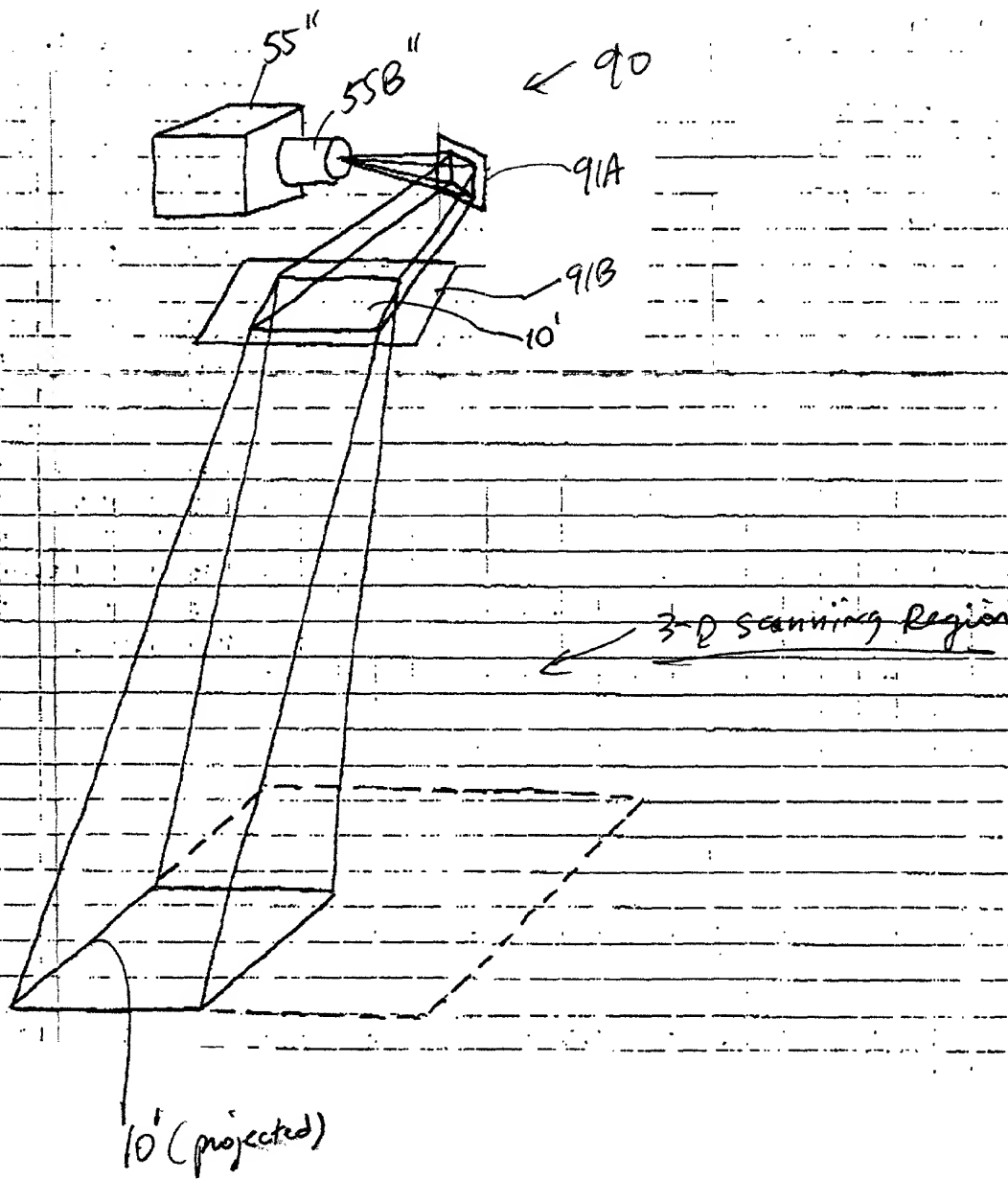
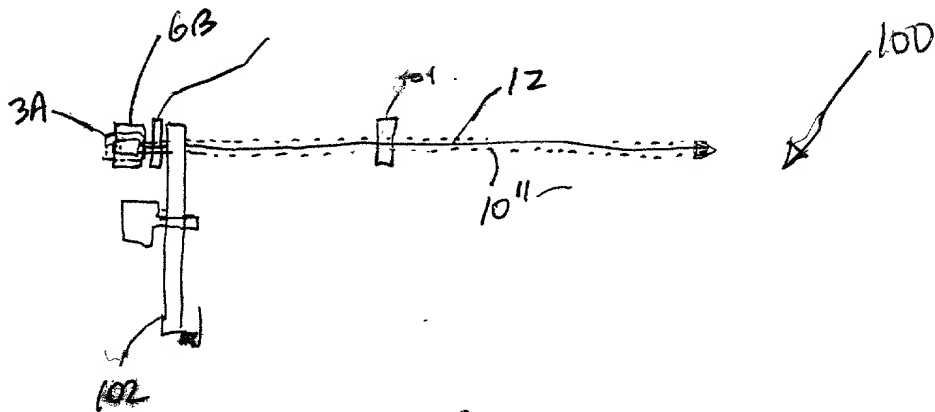
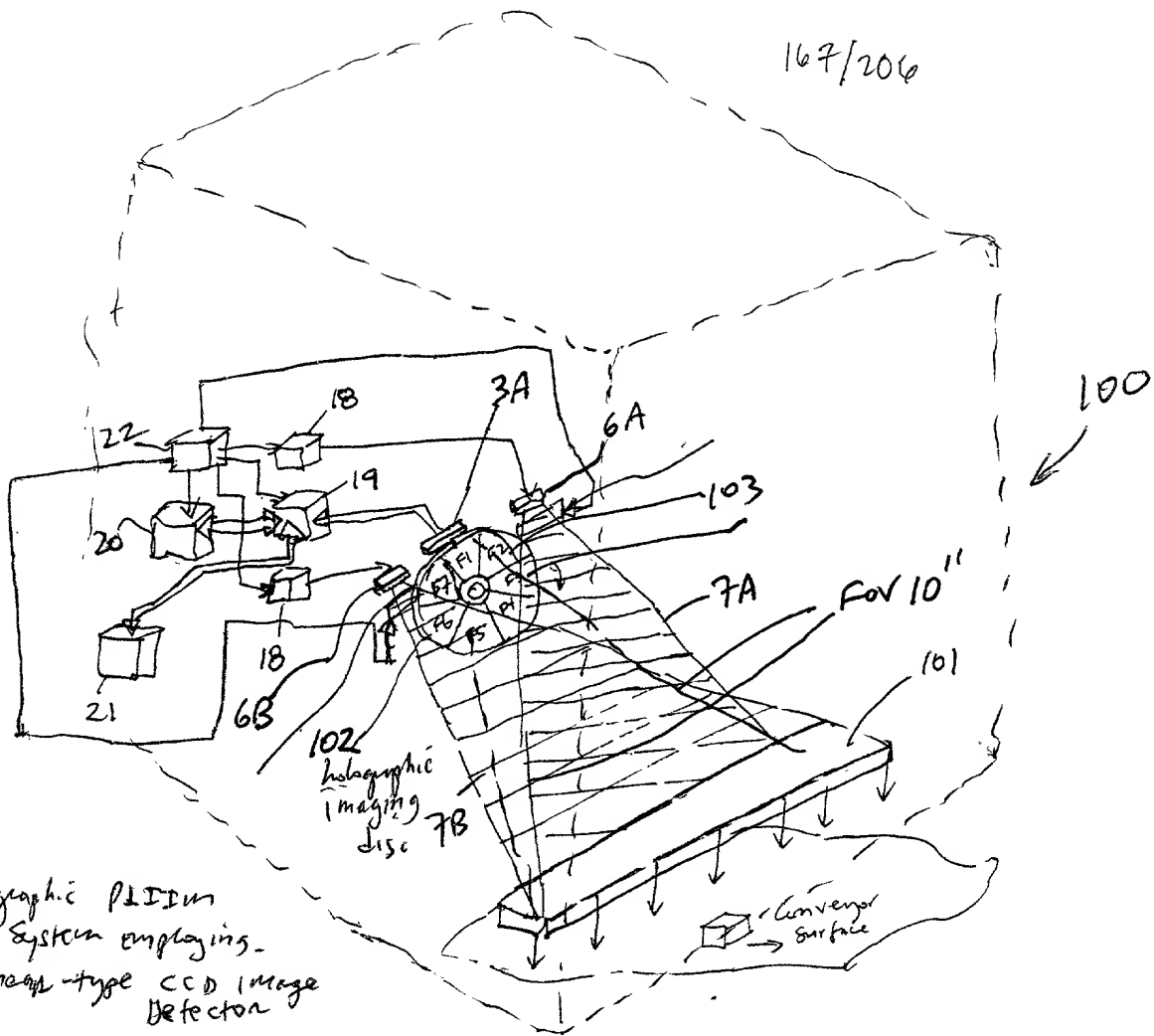


FIG. 6E4

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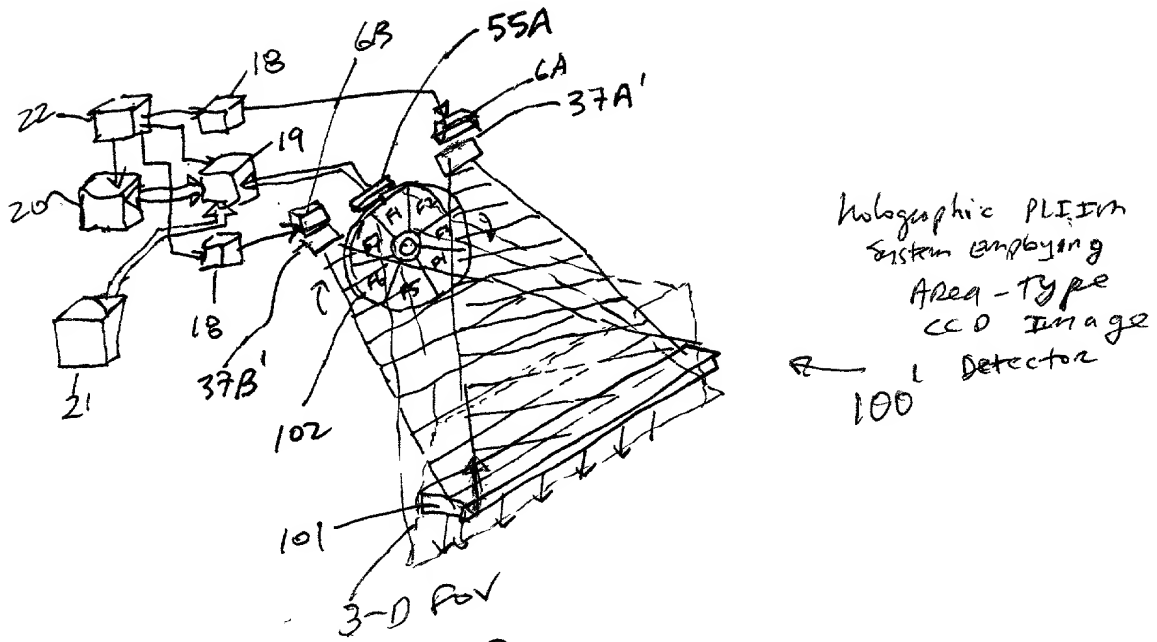


FIG. 8A

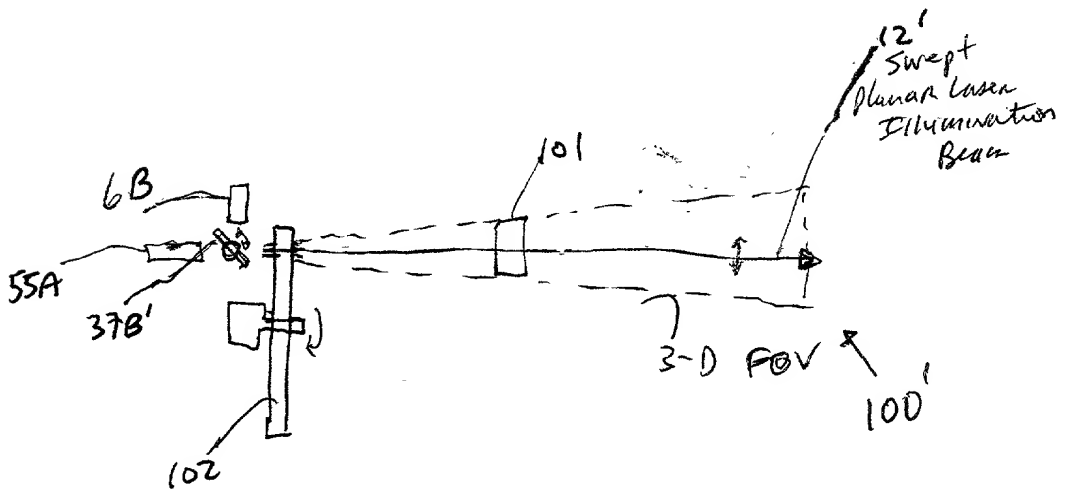


FIG. 8B

1-D CCD SCANNER EMBODIMENT

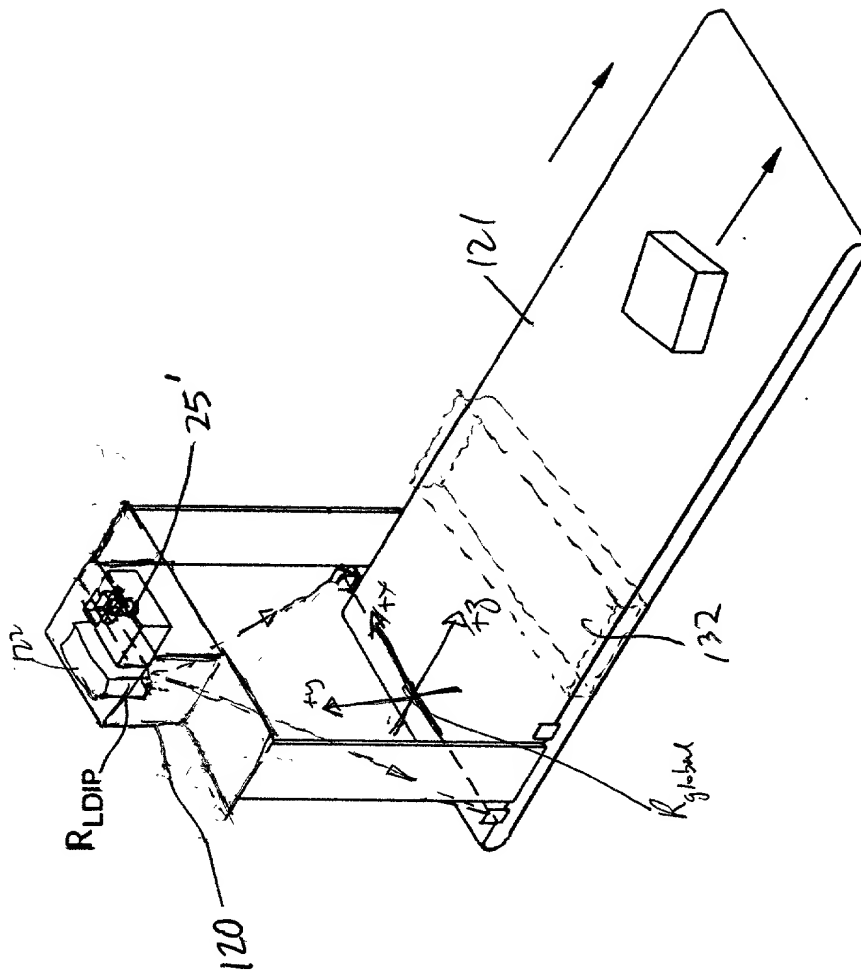


FIG. 9

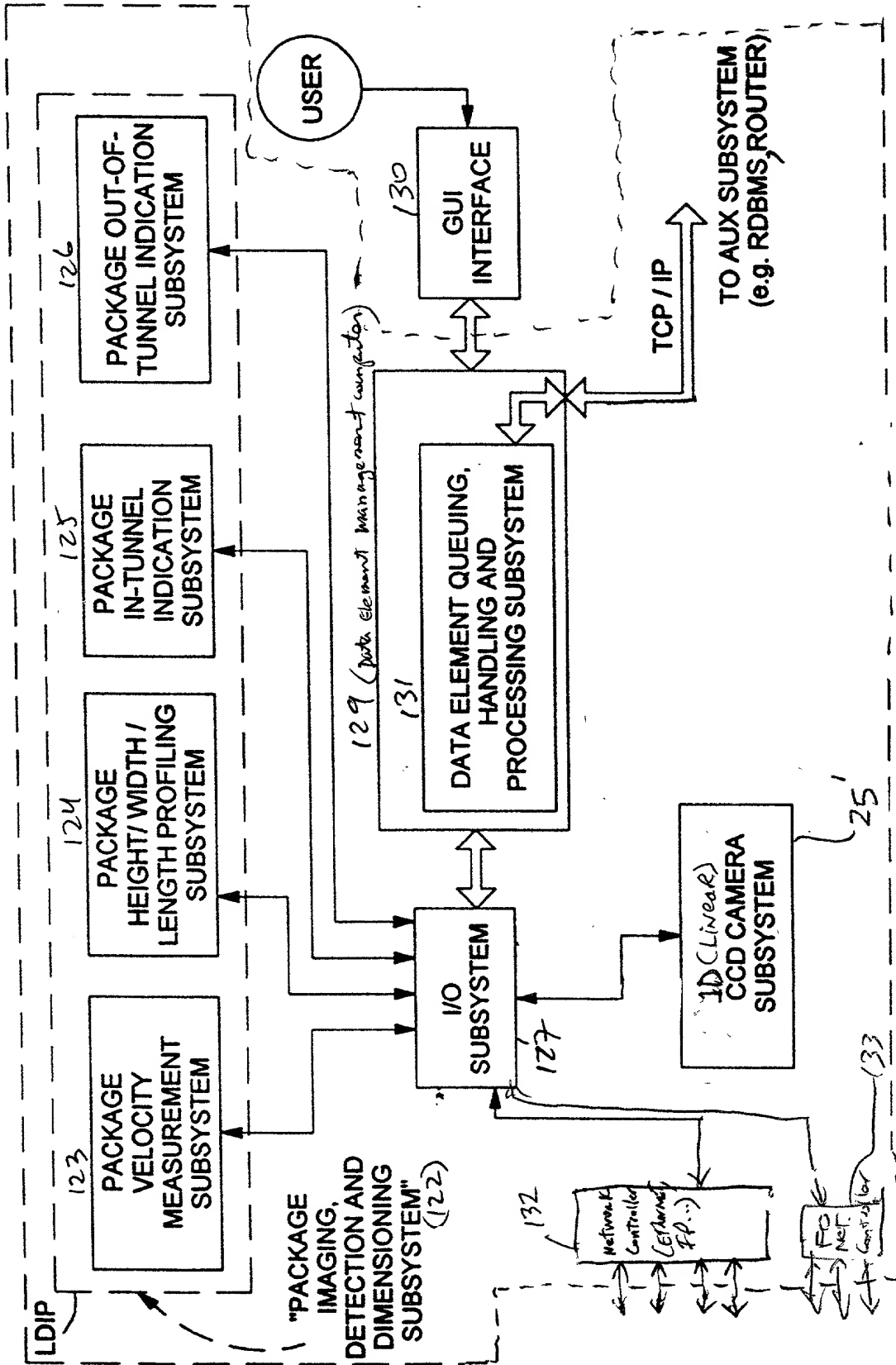


FIG. 10

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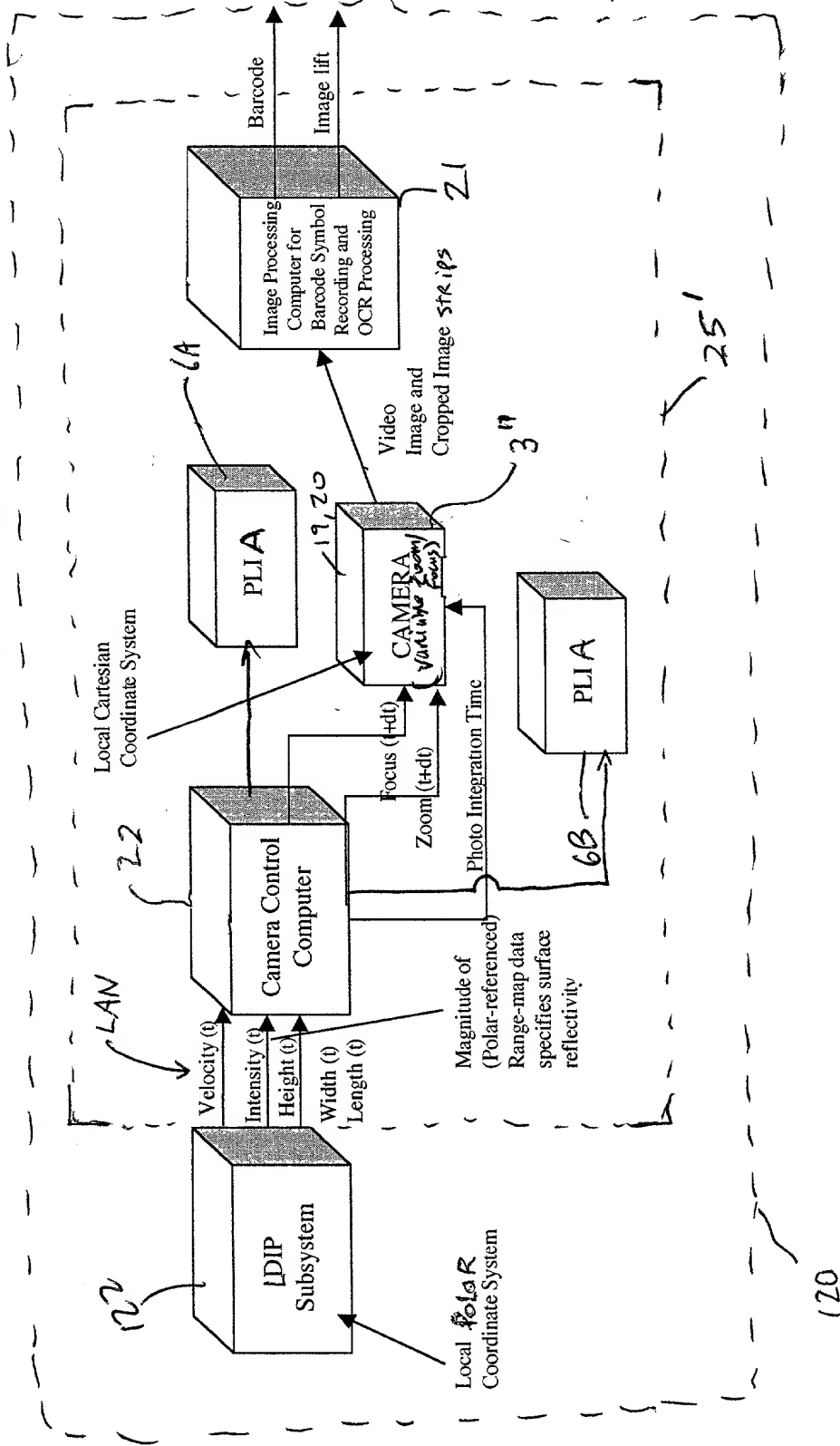


FIG. 11

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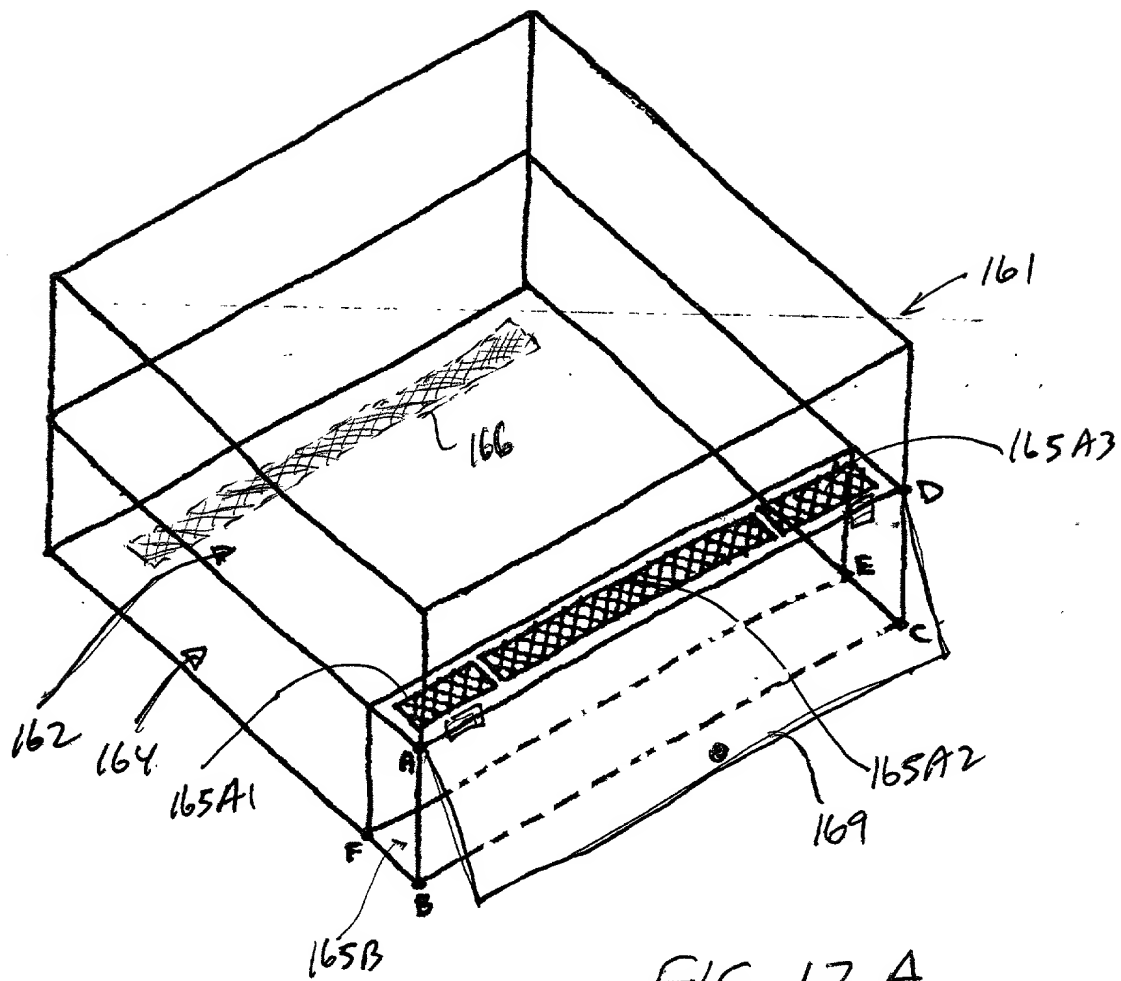


FIG. 12A

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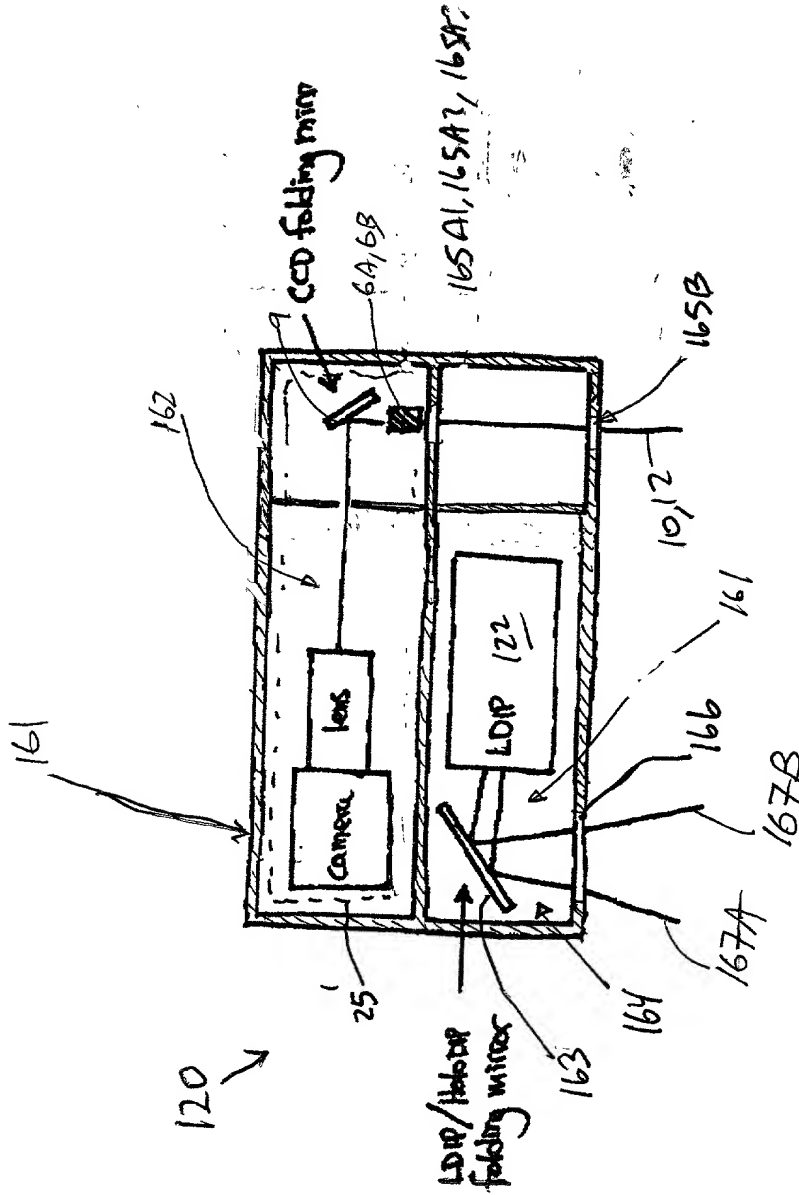


FIG. 12B

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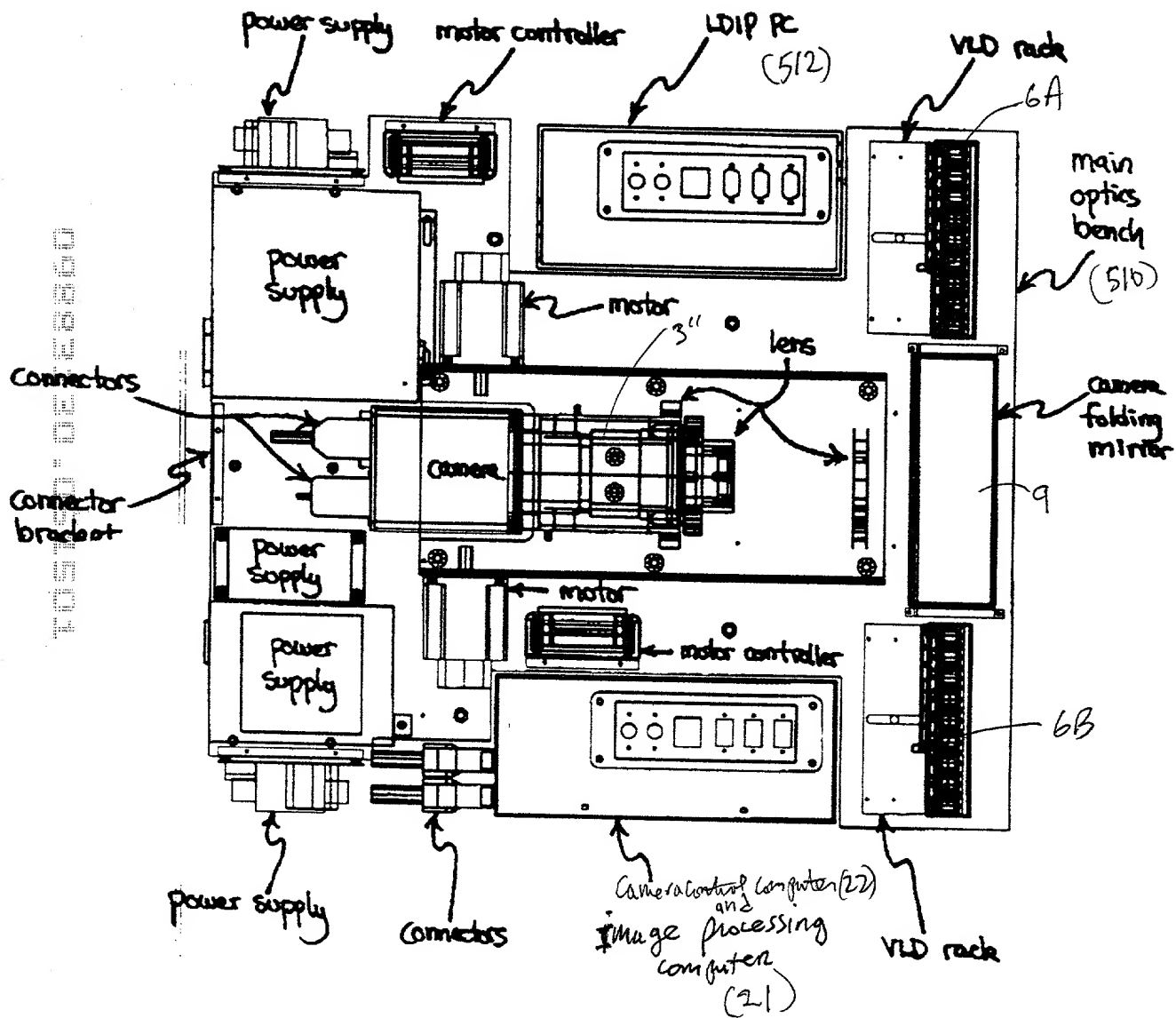


FIG. 12C

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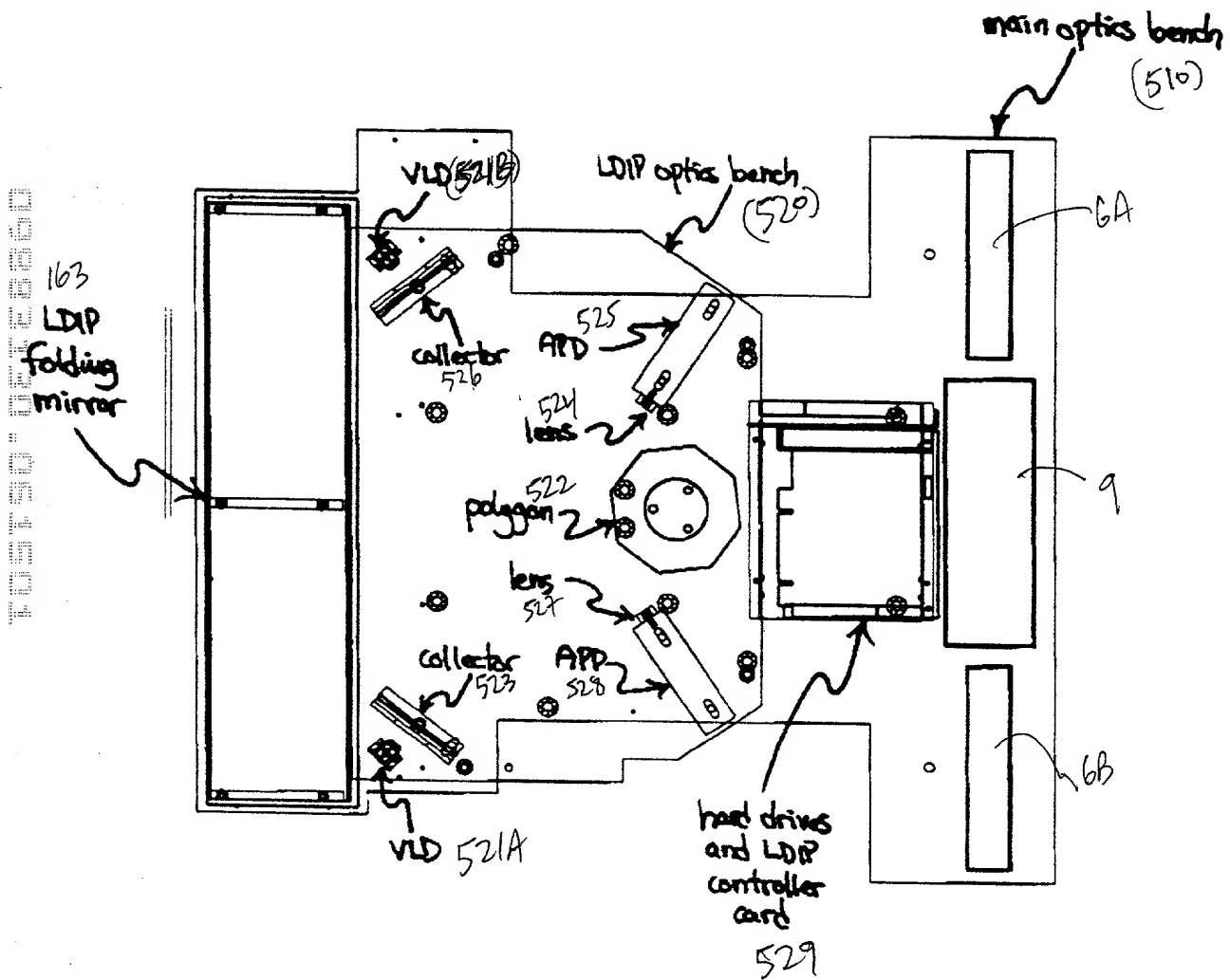


FIG 12D

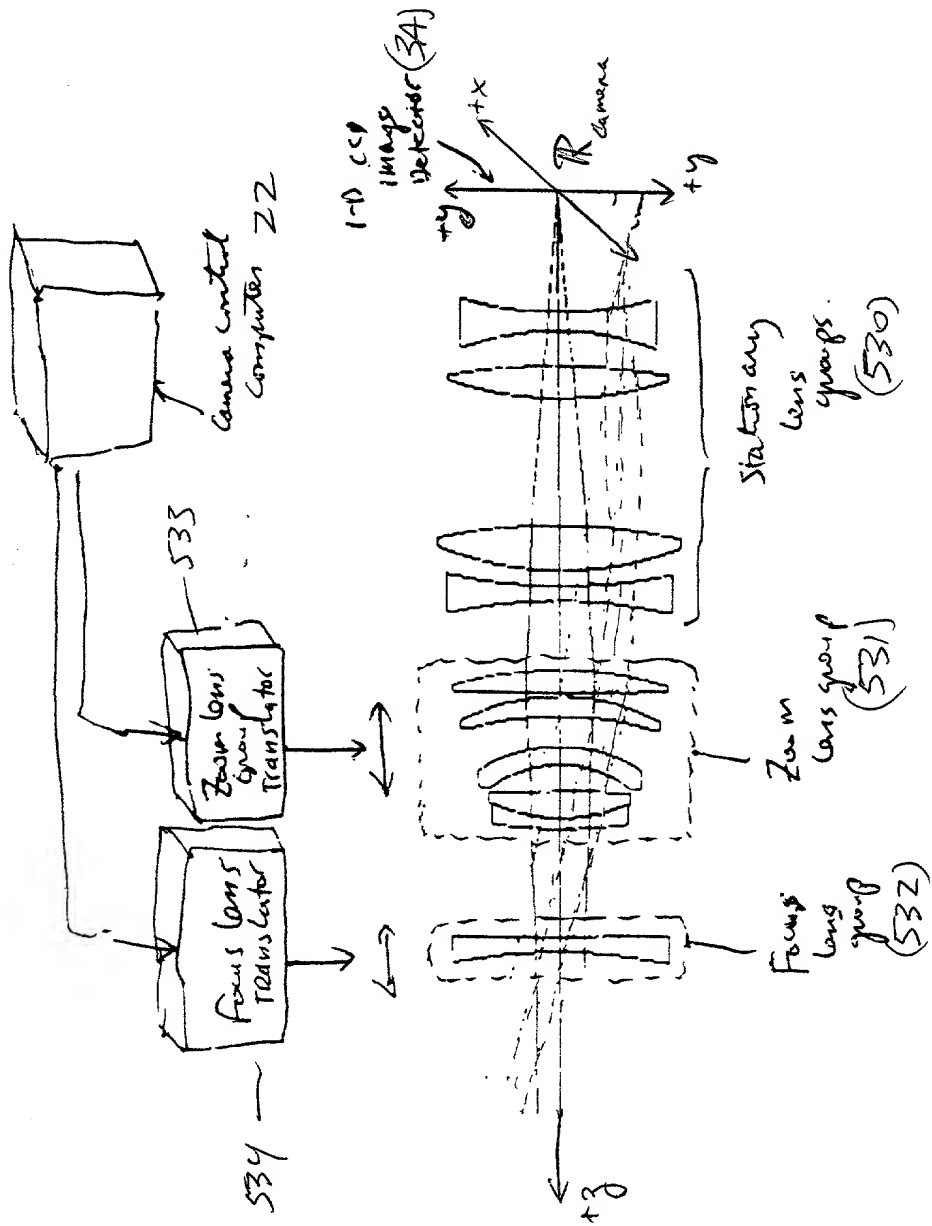


FIG. 12E

(main optics)
(lens groups)

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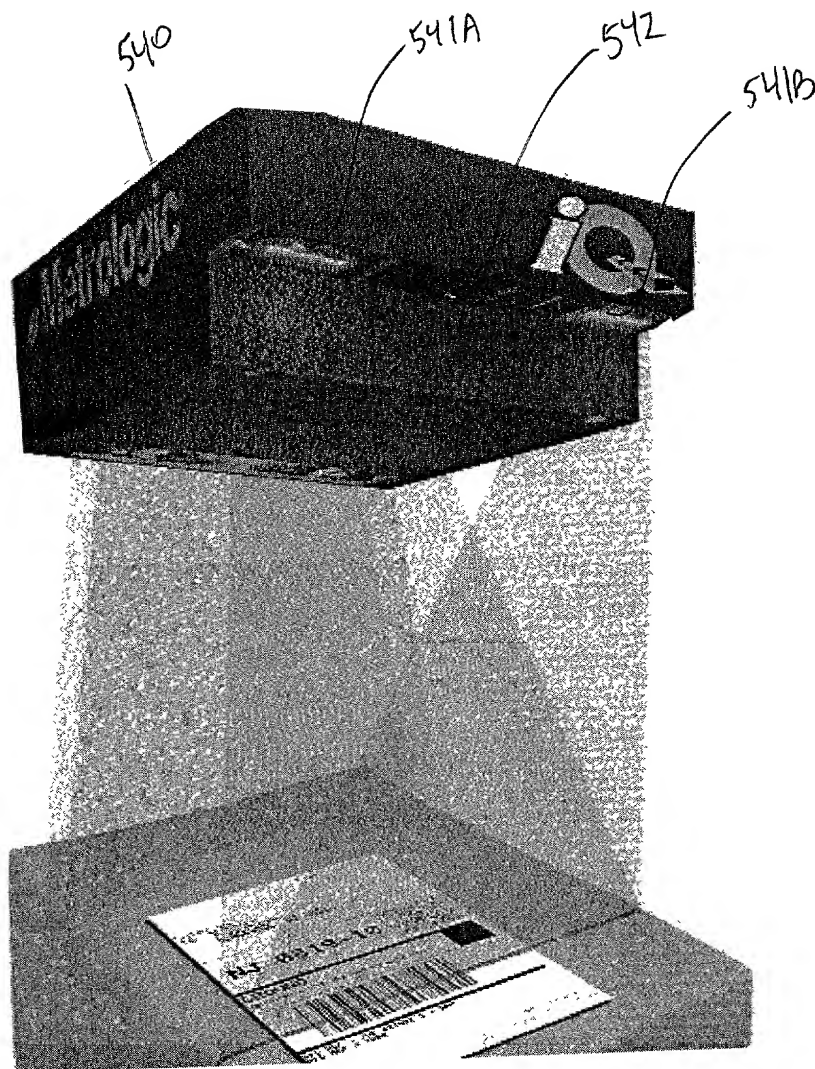


FIG. 13A

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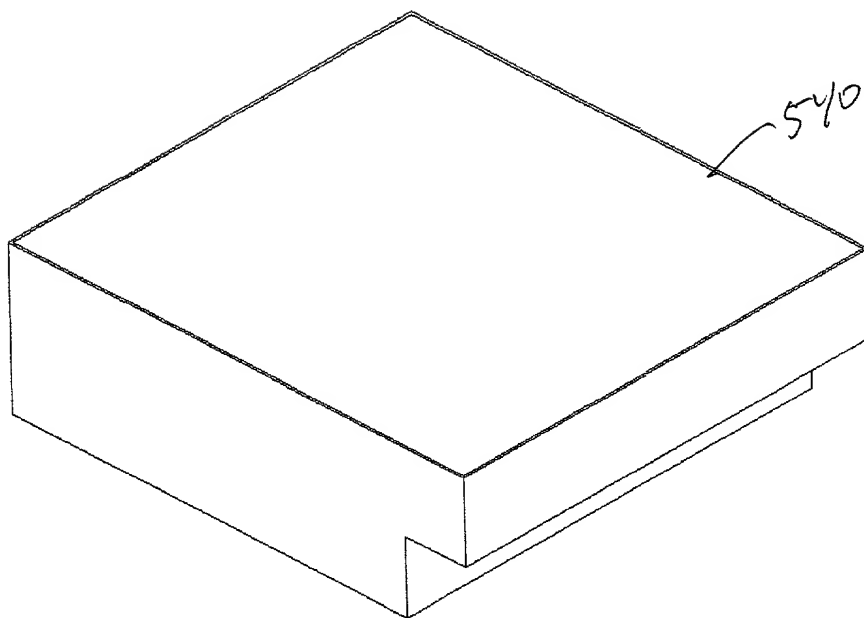


FIG. 13B

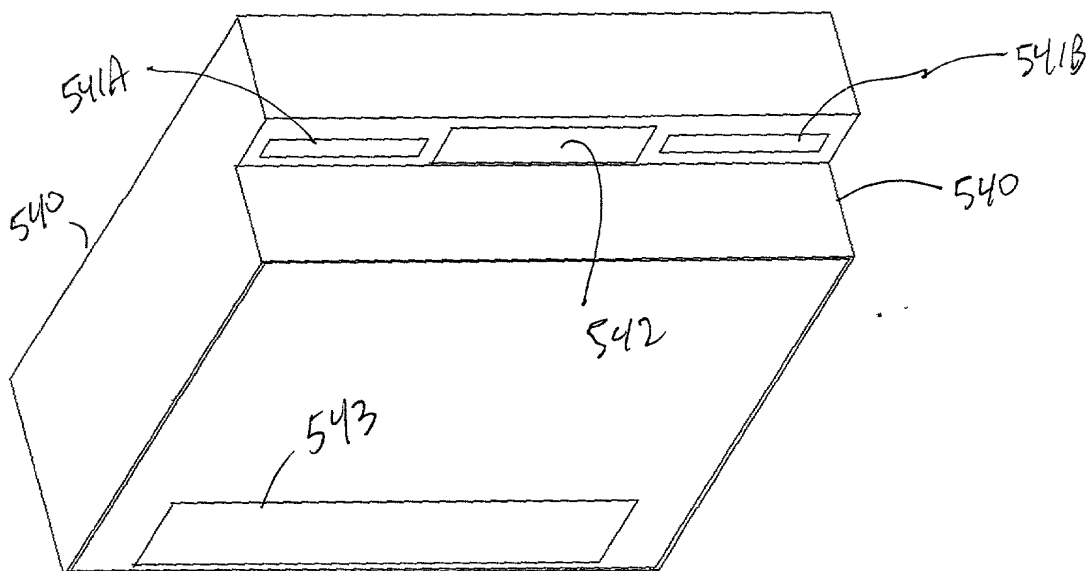


FIG. 13C

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PLLIM-BASED PACKAGE IDENTIFICATION AND DIMENSIONING (PID) SYSTEM

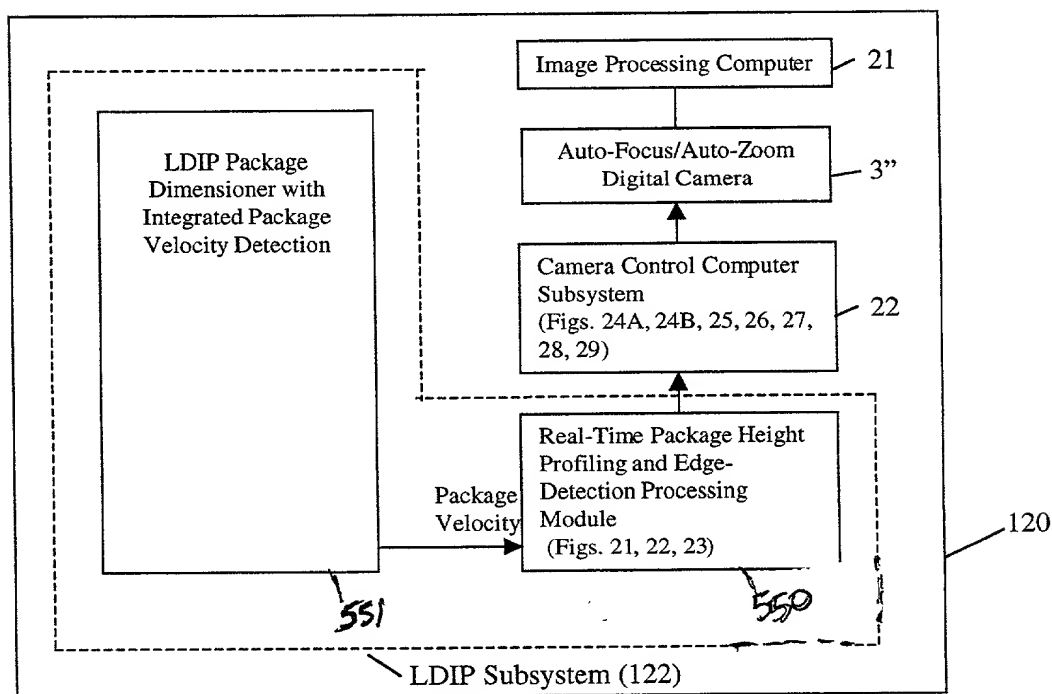


FIG. 14

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LDIP REAL-TIME PACKAGE HEIGHT PROFILE AND EDGE DETECTION METHOD

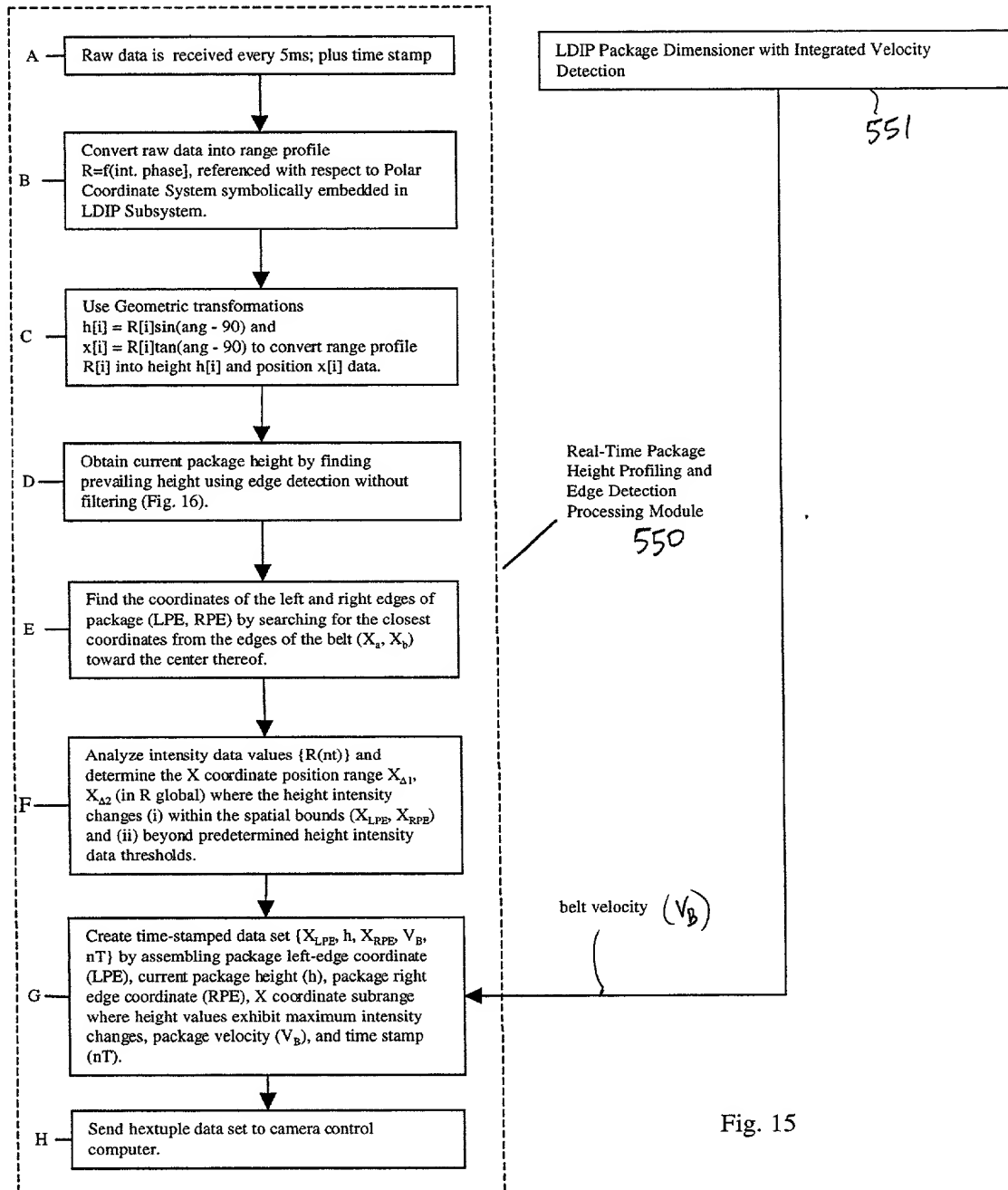
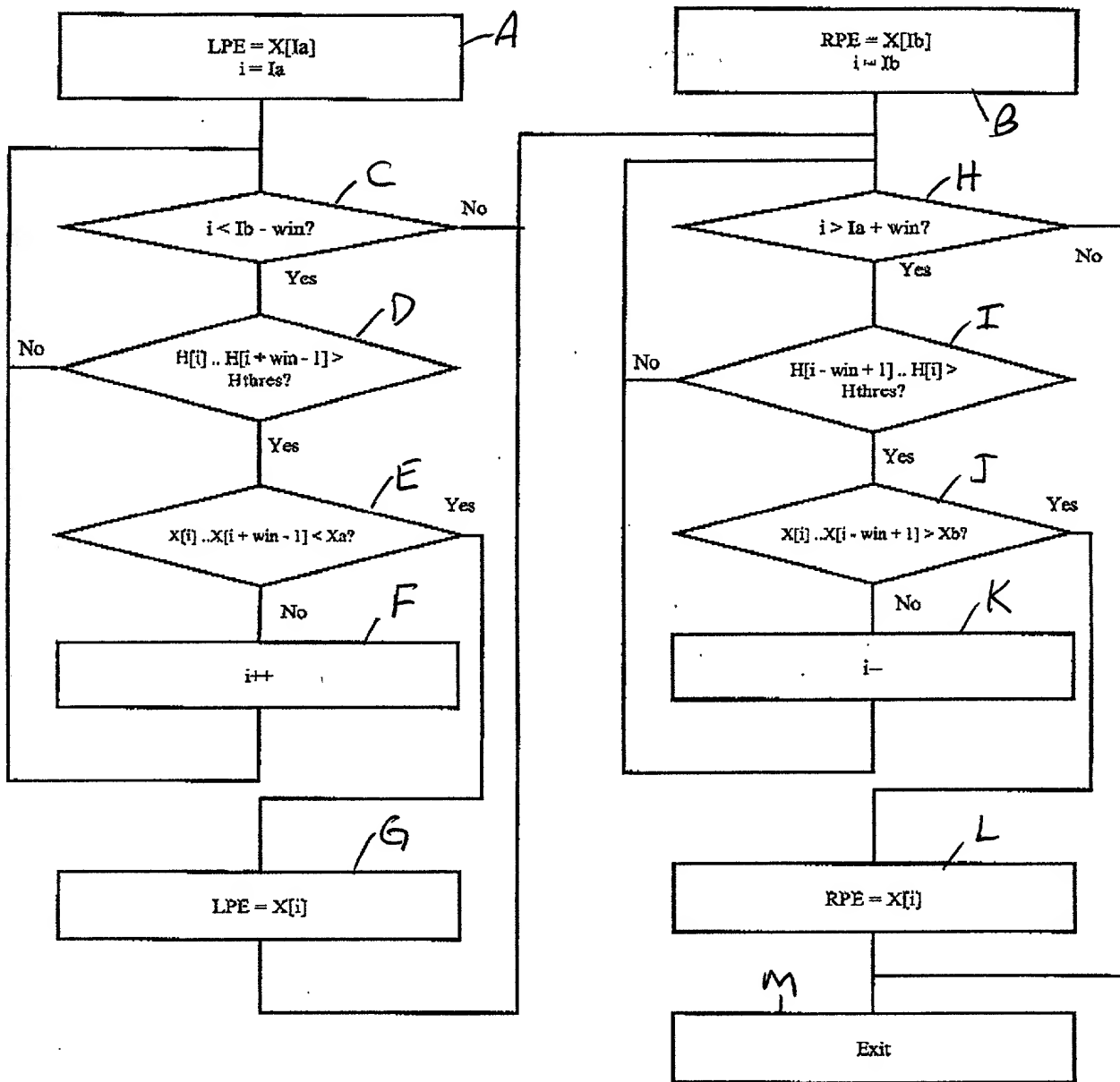


Fig. 15

LDIP Real Time Package Edge Detection



X_a = location of belt left edge; X_b = location of belt right edge
 I_a = belt edge edge pixel; I_b = belt right edge pixel
 LPE = Left package edge; RPE = Right package edge
 $H[]$ = Pixel height array; $X[]$ = Pixel location array
 win = package detection window

FIG. 16

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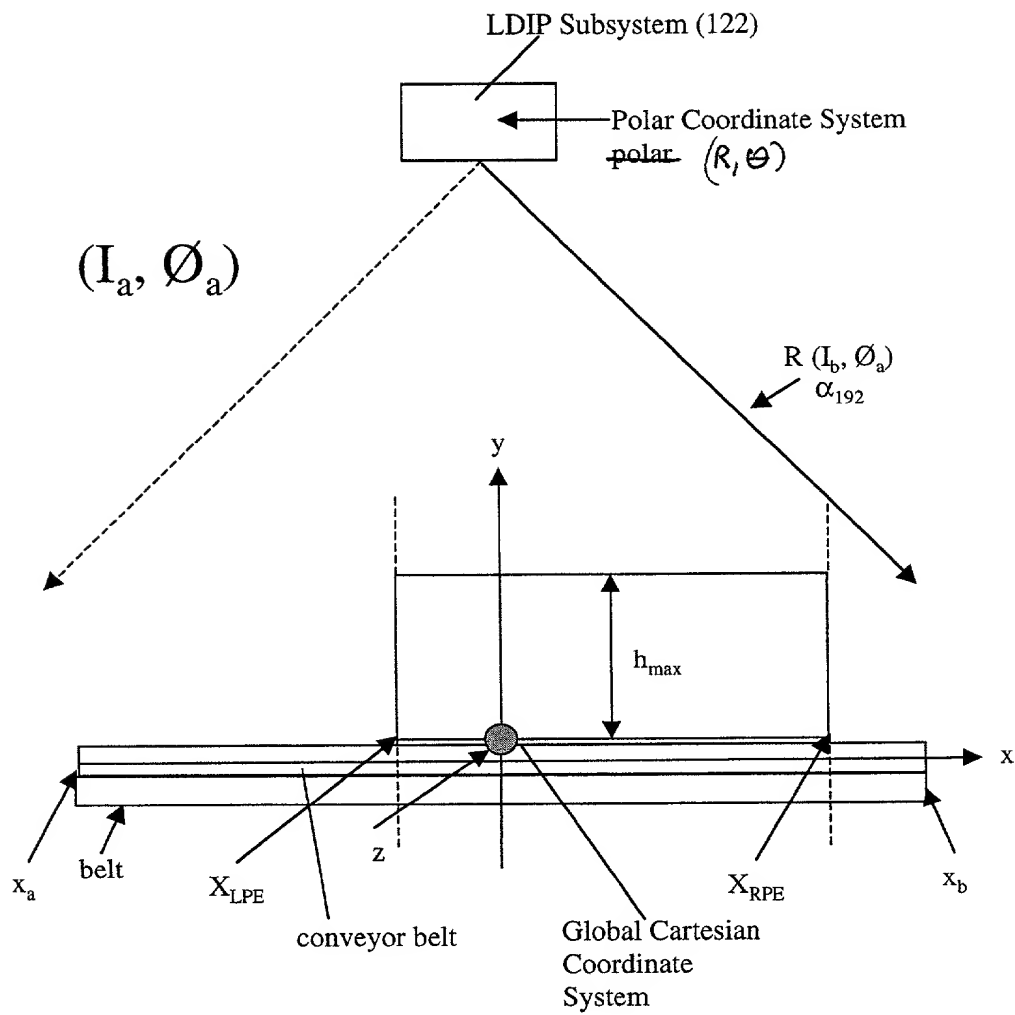


Fig. 17

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INFORMATION MEASURED AT SCAN ANGLES BEFORE COORDINATE TRANSFORMS

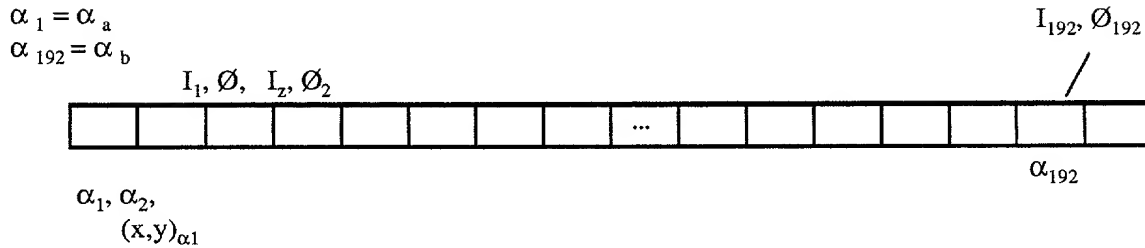


Fig. 17A

RANGE AND POLAR ANGLE MEASURES TAKEN AT SCAN ANGLE α BEFORE COORDINATE TRANSFORMS

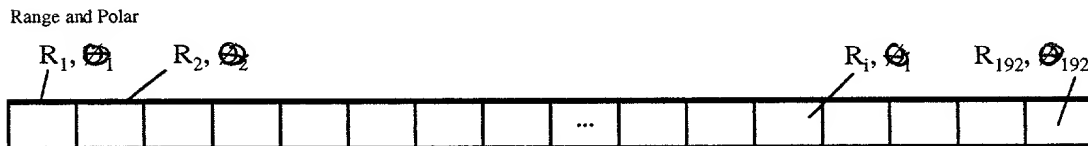


Fig. 17B

MEASURED PACKAGE HEIGHT AND POSITION VALUES AFTER COORDINATE TRANSFORMS

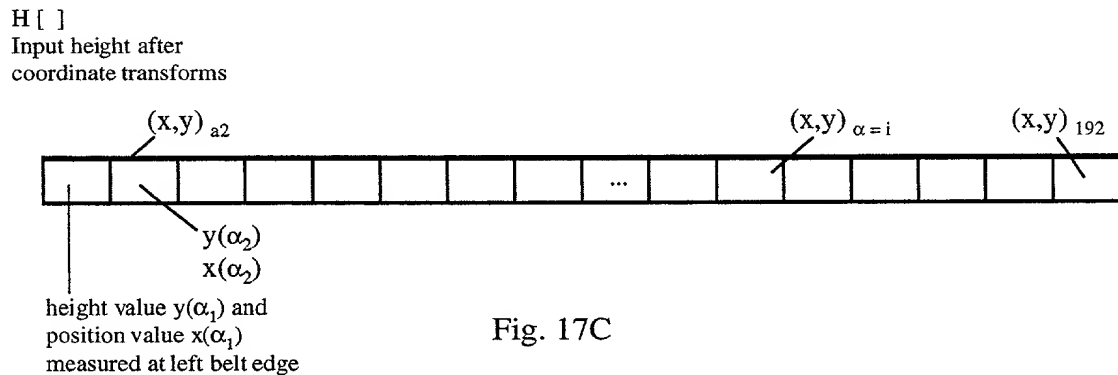


Fig. 17C

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CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA CONTROL SUBSYSTEM OF EACH OBJECT ATTRIBUTE ACQUISITION AND ANALYSIS SYSTEM

560

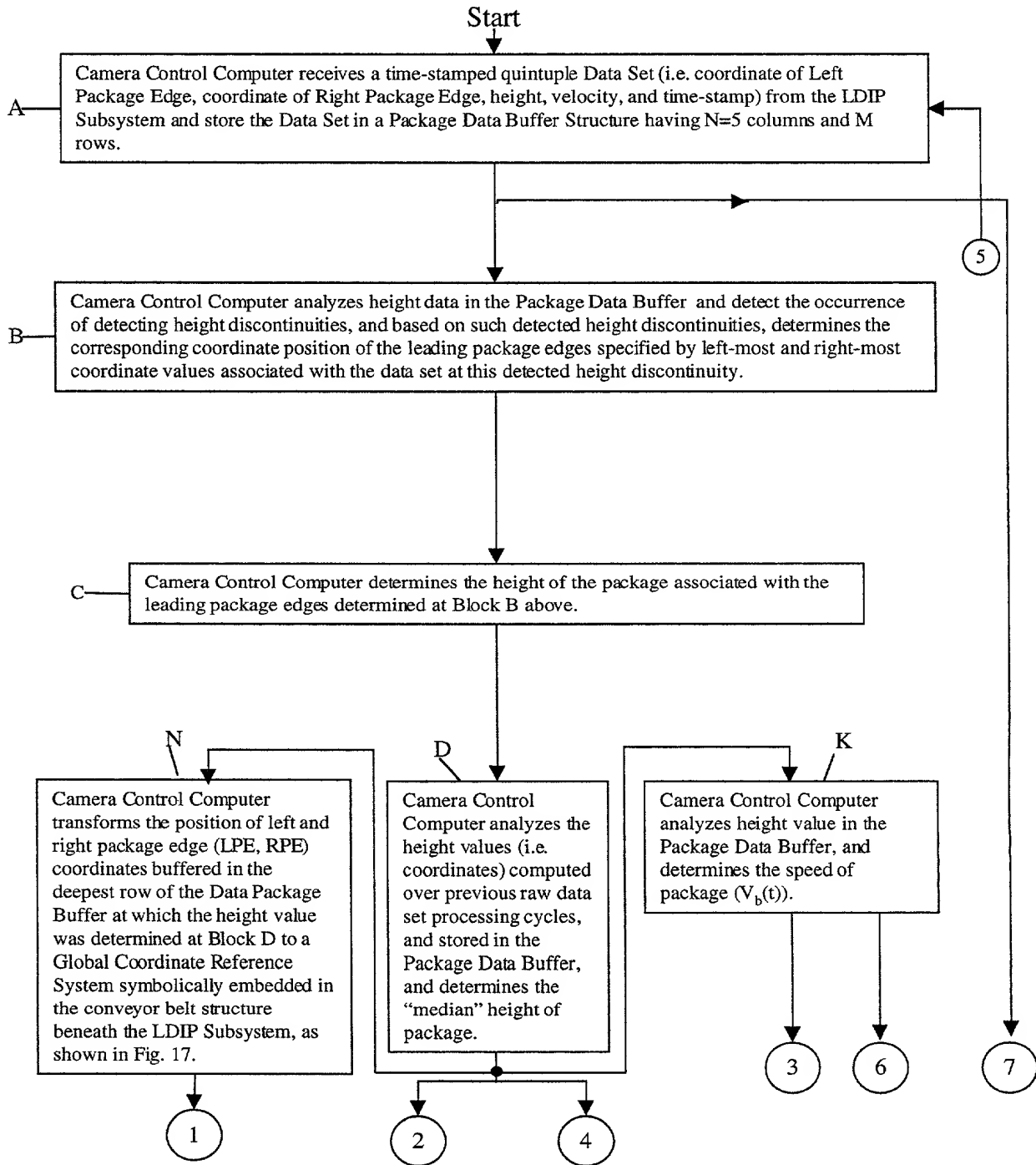


Fig. 18A

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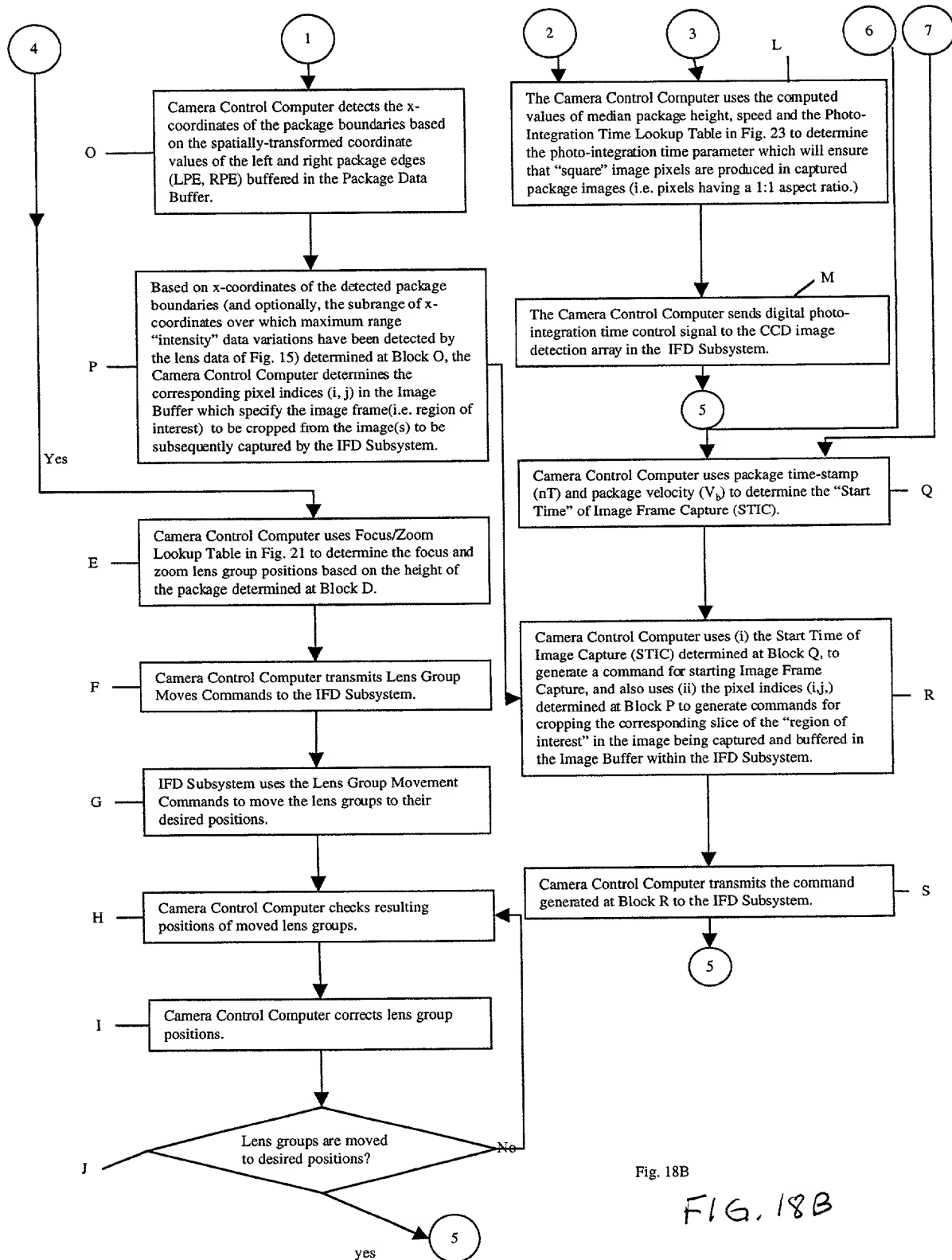


Fig. 18B

FIG. 18B

100/200

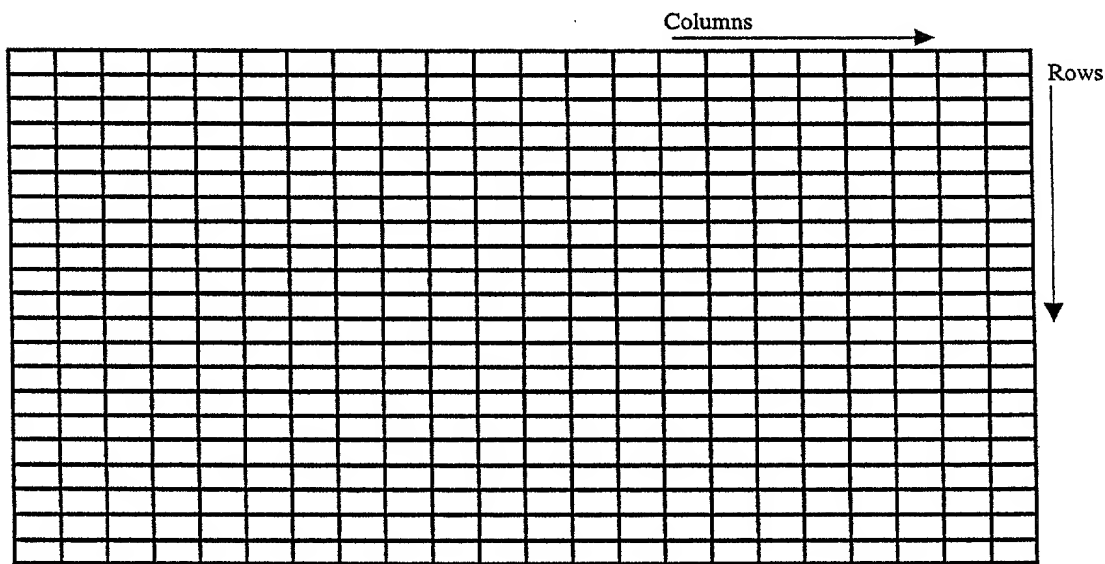
x coordinate subrange where maximum range "intensity" variations have been detected

Left Package Edge (LDE)	Package Height (h)	Right Package Edge (RPE)	Package Velocity	Time-stamp (nT)

Package Data Buffer (FIFO)

Row 1
Row 2
Row 3
Row 4
Row 5
Row M

Fig. 19



Camera Pixel Data Buffer
pixel indices (i,j)

Fig. 20

Week-48 Table

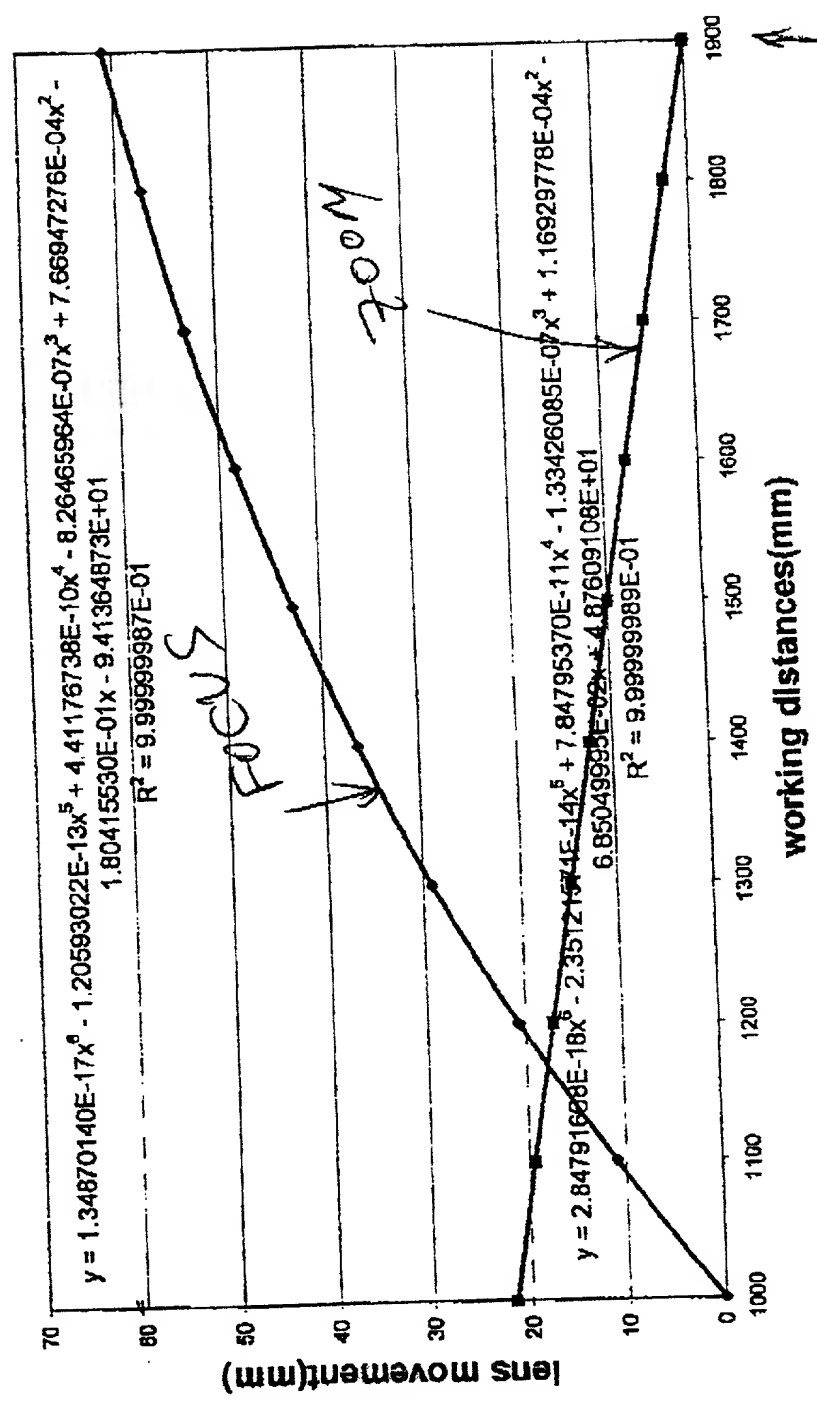
Distance from Camera H (mm)	Zoom group distance (mm) Y (Zoom)	Focus group distance (mm) Y (Focus)
1000	21.57489228	2.47E-05
1100	19.38089696	10.99009783
1200	17.10673434	20.65783177
1300	14.77137314	29.10917002
1400	12.39153565	36.47312595
1500	9.979114358	42.87845436
1600	7.540639114	48.44003358
1700	5.078794775	53.25495831
1800	2.595989366	57.40834303
1900	0.099972739	60.98883615

(use interpolation techniques for working distances between listed points in table)

FIG. 21

* Note: The focal distance & zoom (eff. focal length) of camera lens are coupled (inter-dependent) in this commercial embodiment. Camera has a fixed aperture F5.6

Focus and Zoom lens movement vs. working distances



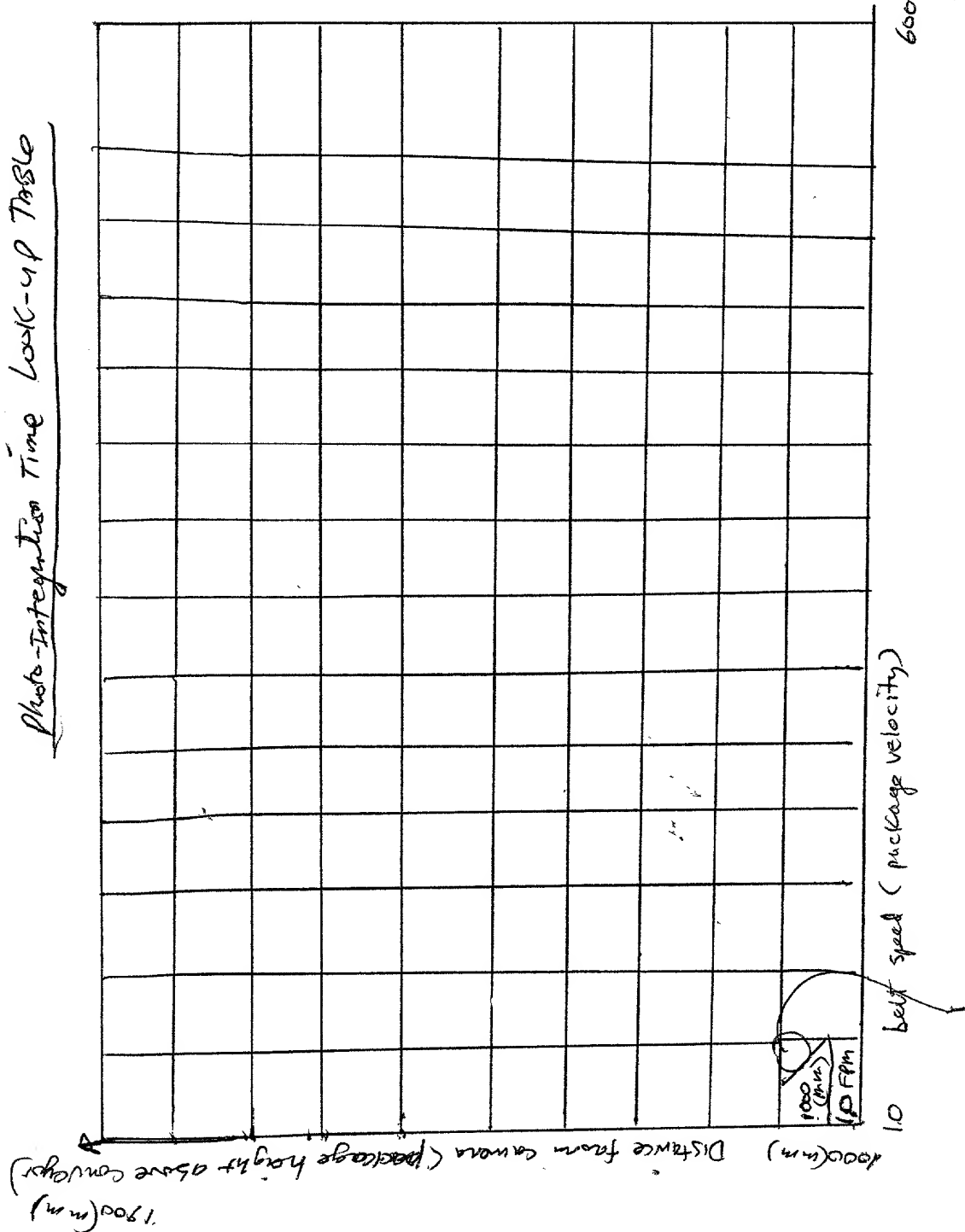
↑ (inches) 36 above conveyor belt
← package height above conveyor
conveyor-belt surface

FIG. 22

100/200

1000 0000 0000 0000

Photo-Integration Time Look-up Table



1000 / 200

FIG. 23

Photo-Integration
Time value that
ensures square image pixels
(1:1 aspect ratio)

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LOW RESOLUTION 2D CCD CAMERA (61)
HIGH RESOLUTION 2D CCD CAMERA (55")

LDIP (122)

25"

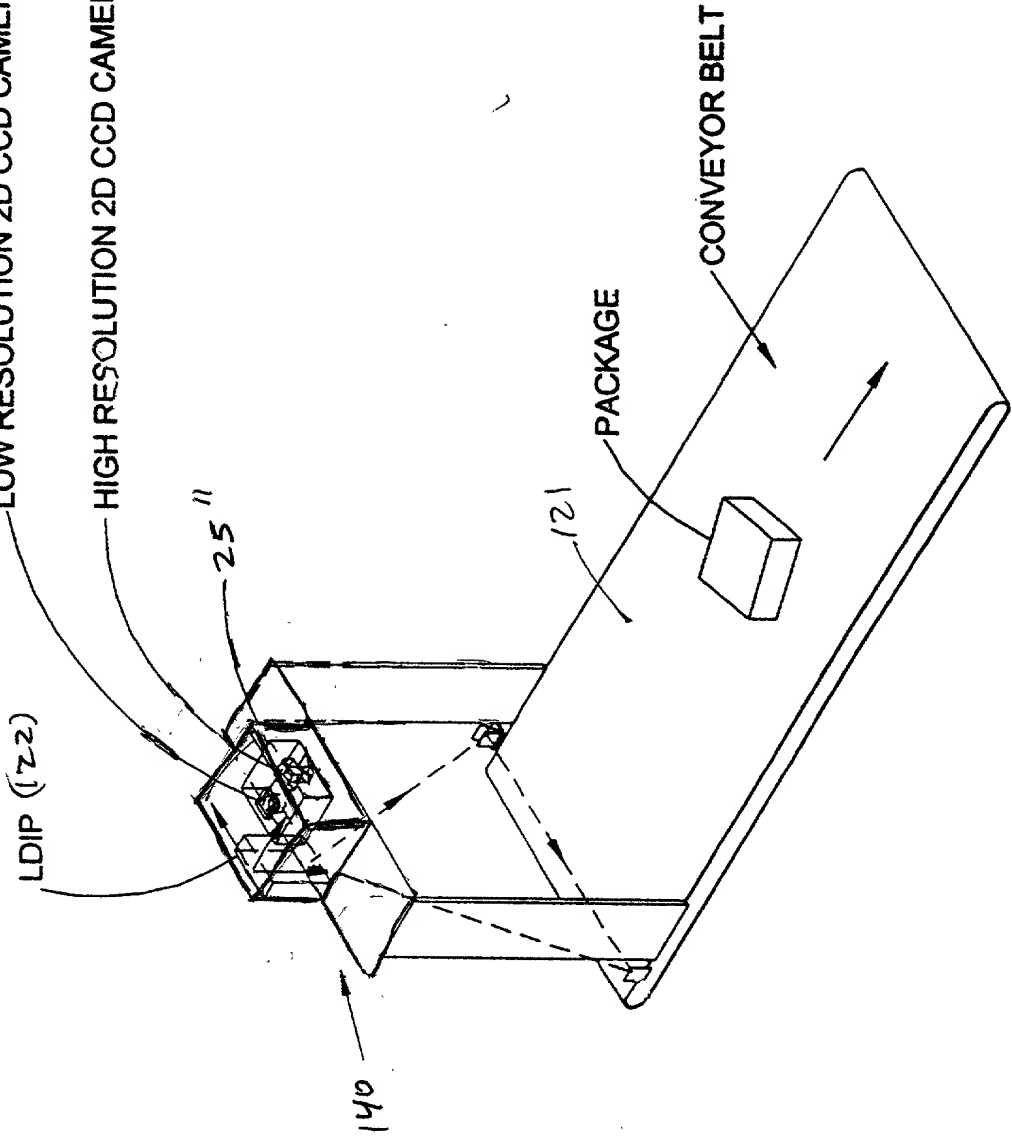
140

121

PACKAGE

CONVEYOR BELT

FIG 24





OH

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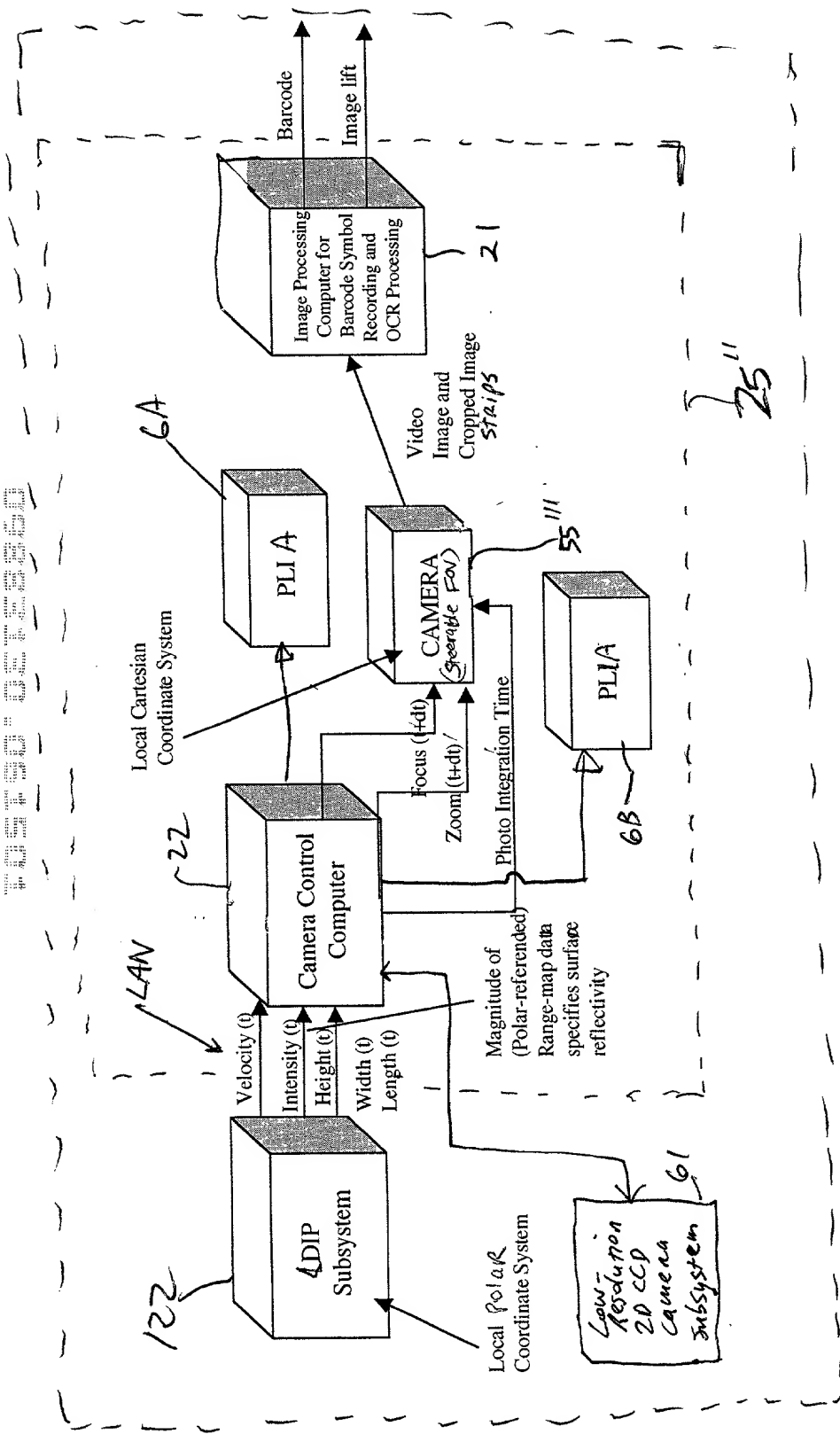
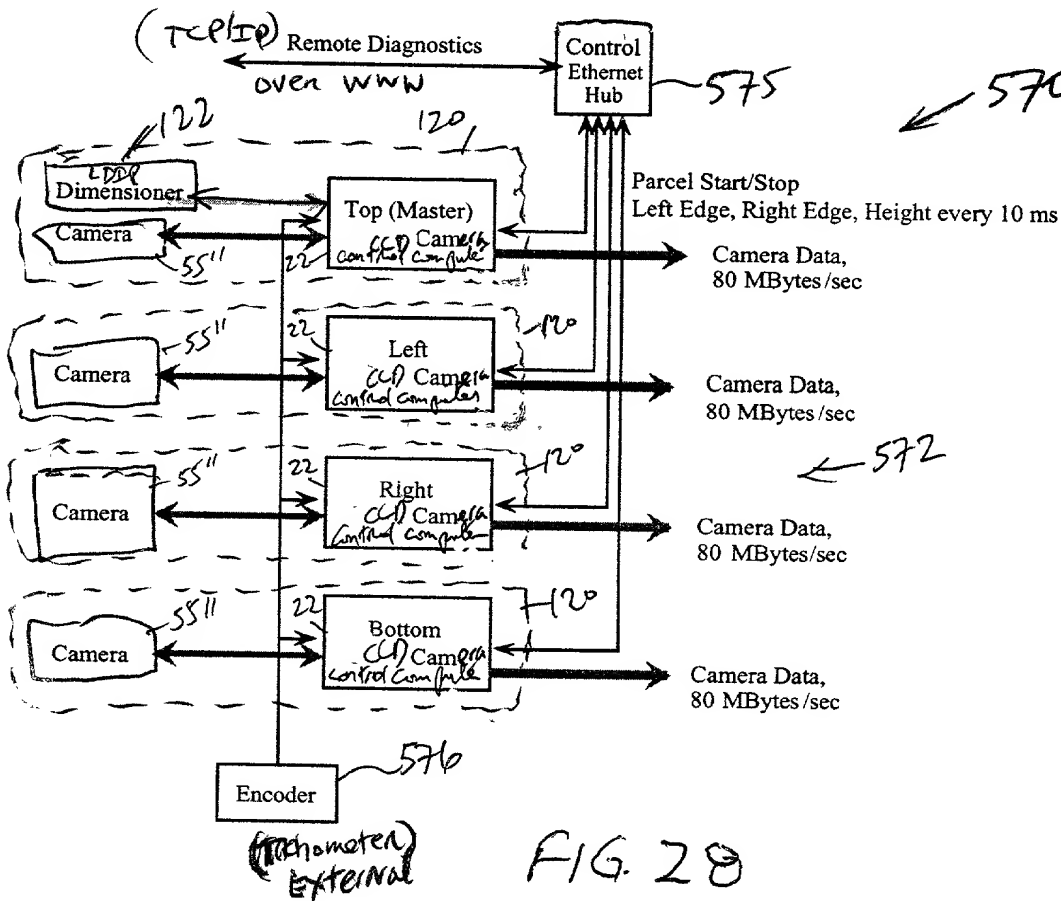
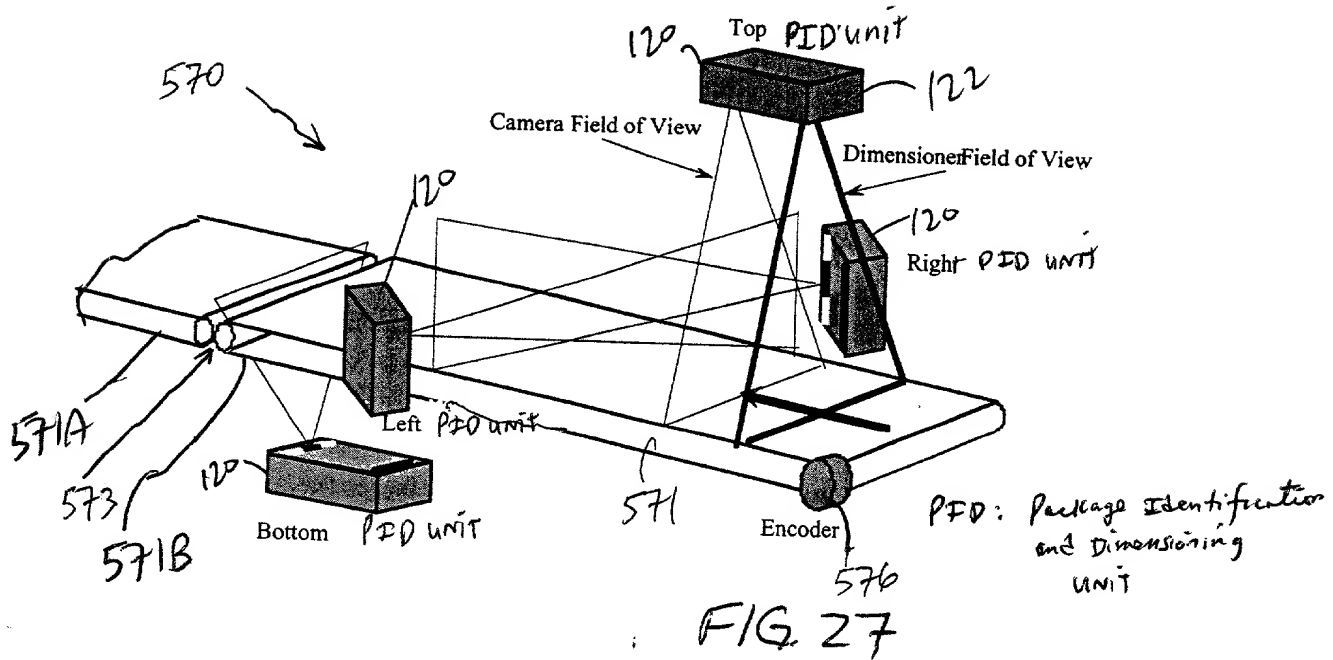


FIG. 26

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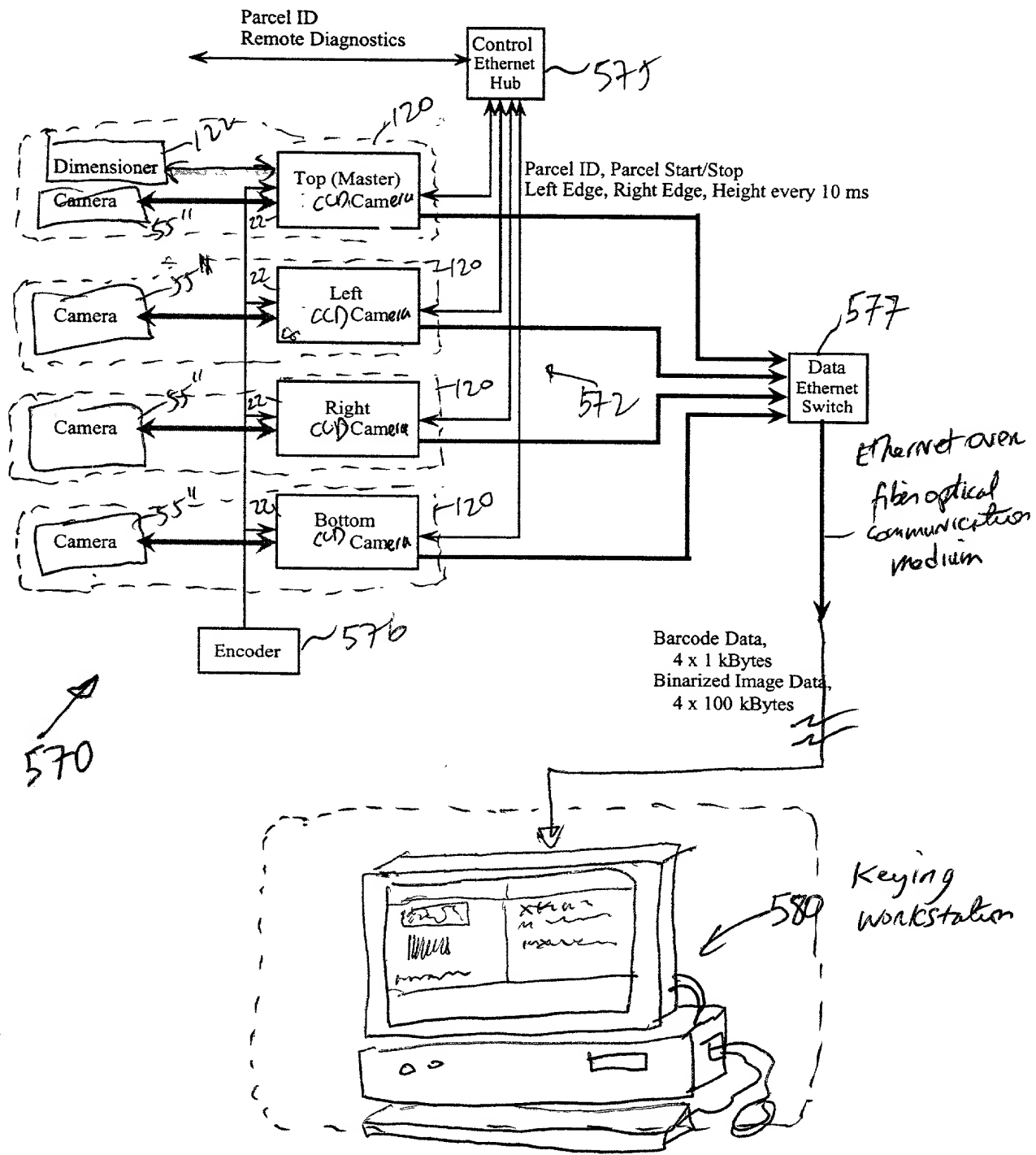


FIG. 29

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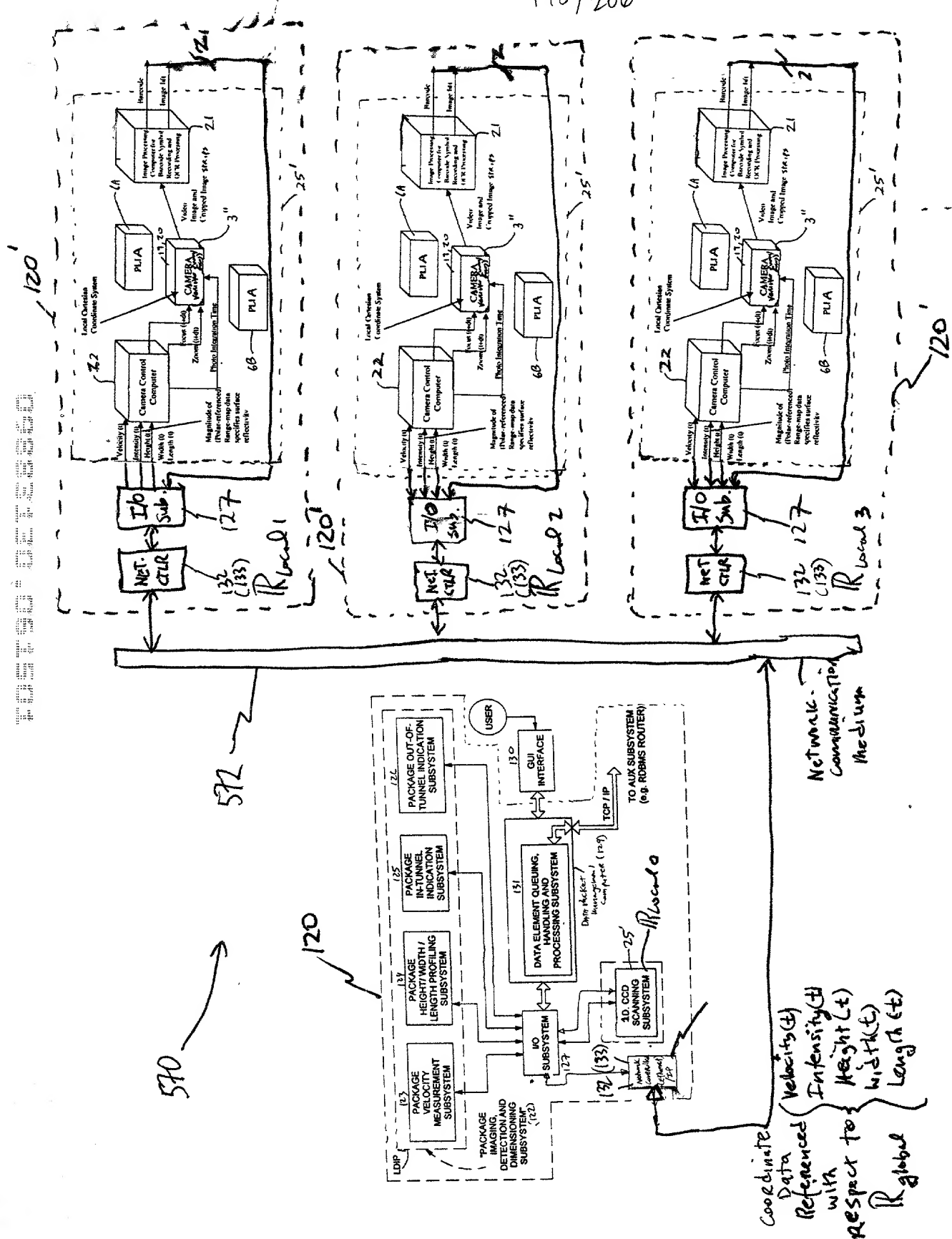


FIG 30

Master unit
120 (122)



FIG. 31

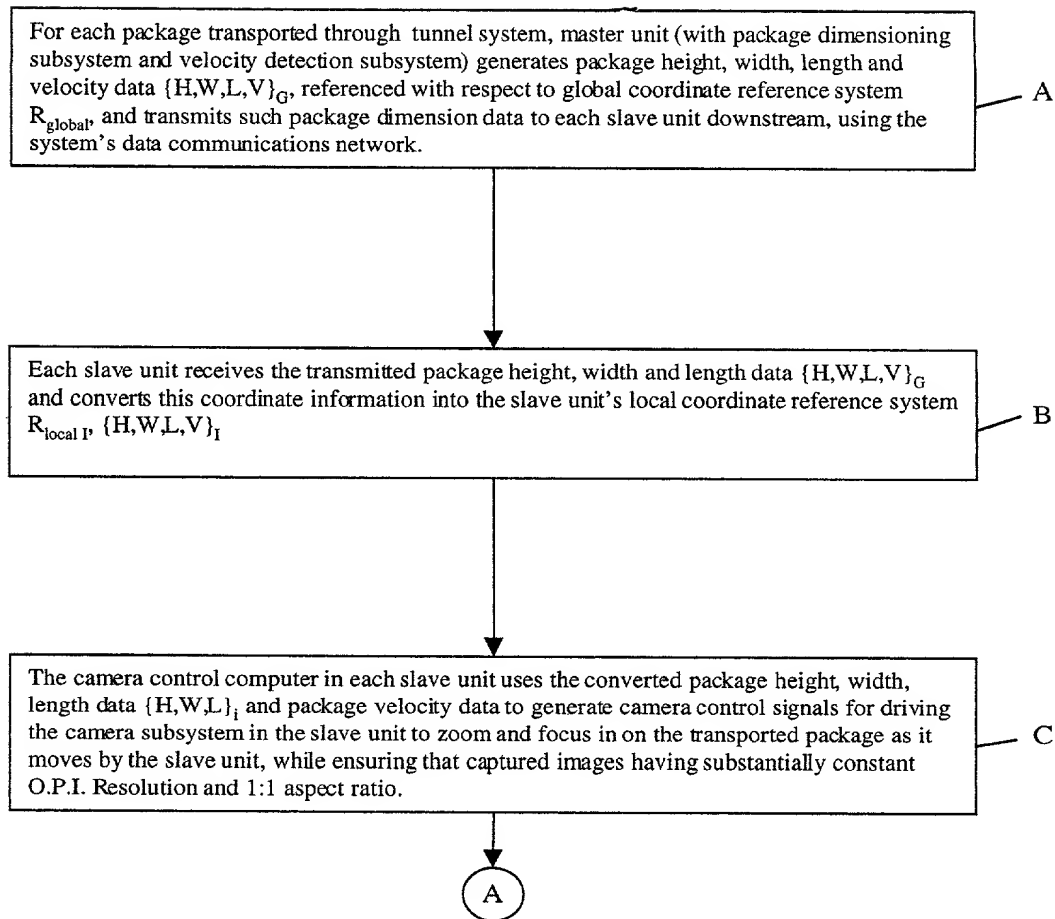


FIG. 32A

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Each slave unit captures images acquired by its intelligently controlled camera subsystem, buffers the same, and processes the images to decode bar code symbol identifiers represented in said images, and/or to perform optical character recognition (OCR) thereupon.

D

The slave unit which decodes a bar code symbol in a processed image automatically transmits a package identification data element (containing symbol character data representative of the decoded bar code symbol) to the master unit (or other designated system control unit employing data element management functionalities) for package data element processing.

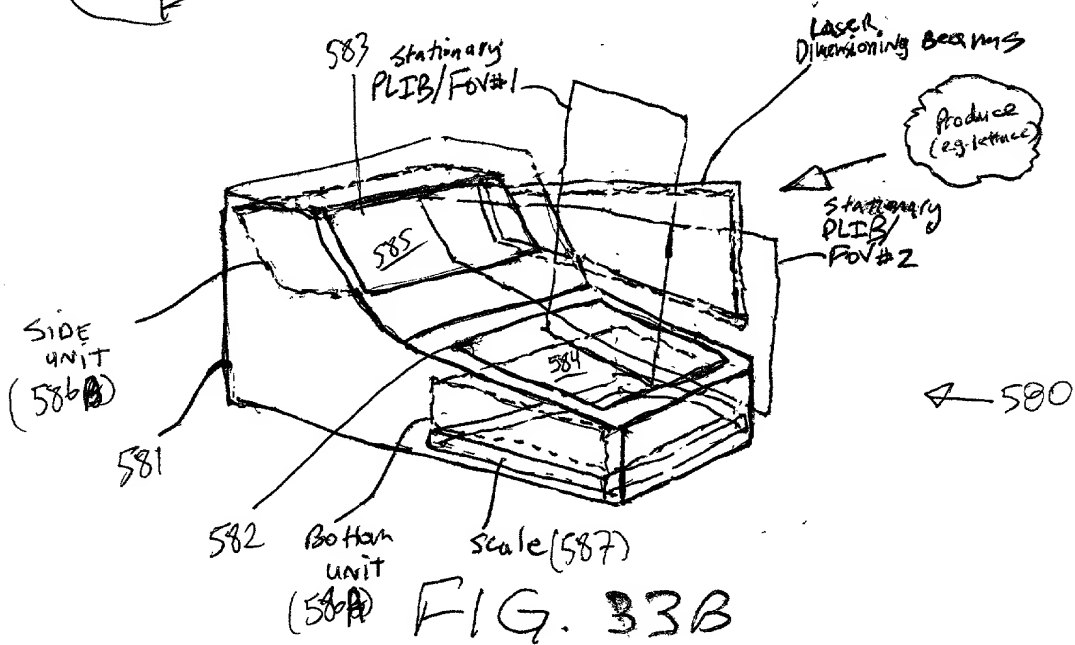
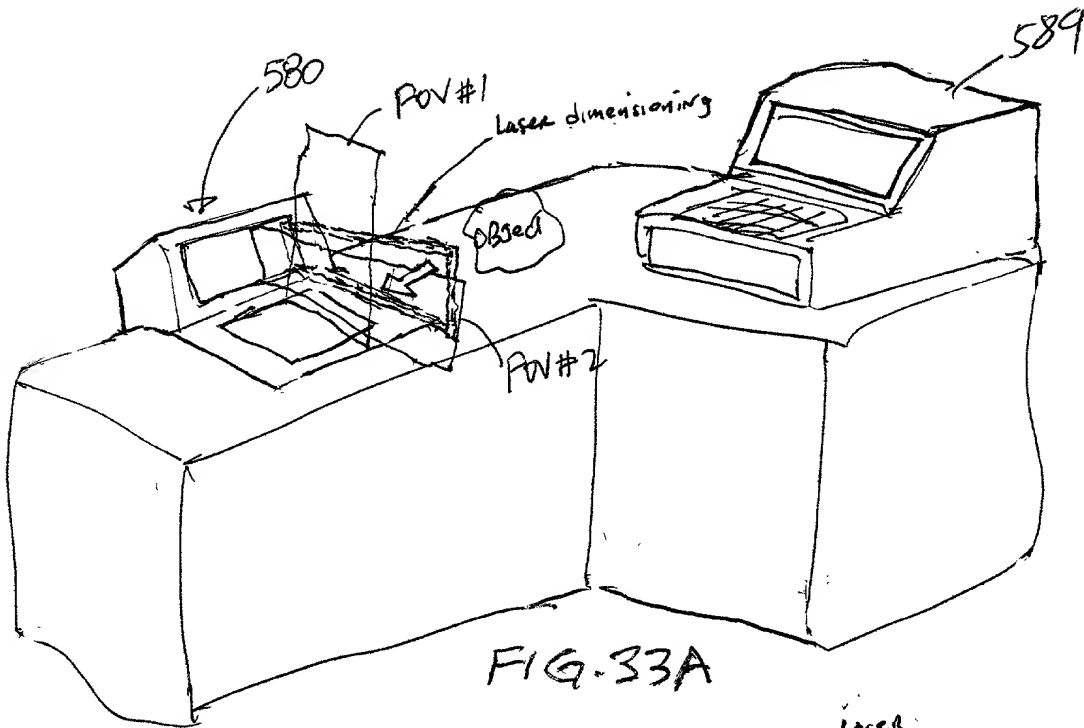
E

Master unit time-stamps received package identification data element, places said data element in a data queue, and processes package identification data elements and time-stamped package dimension data elements in said queue to link each package identification data element with one said corresponding package dimension data element.

F

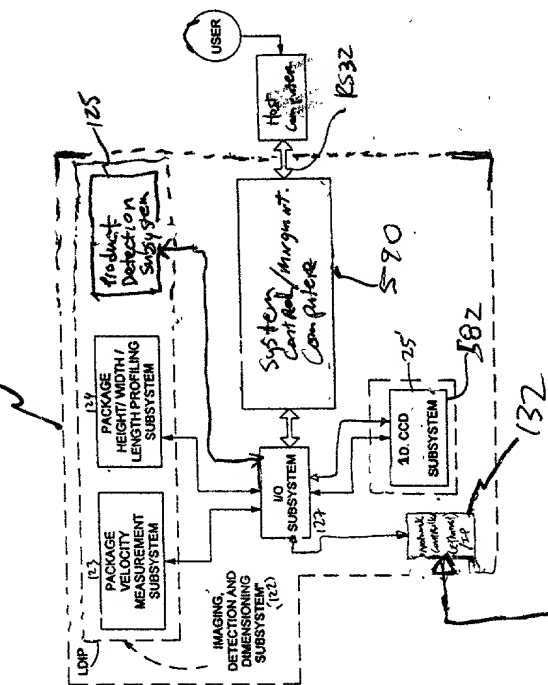
FIG. 32B

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580

586B

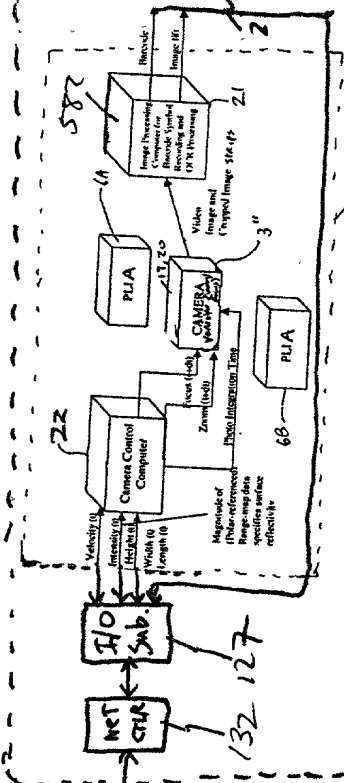


587

Electronic Produce Weight Scale

Host Computer System (Cash Register) 589

588



586A

FIG. 33C

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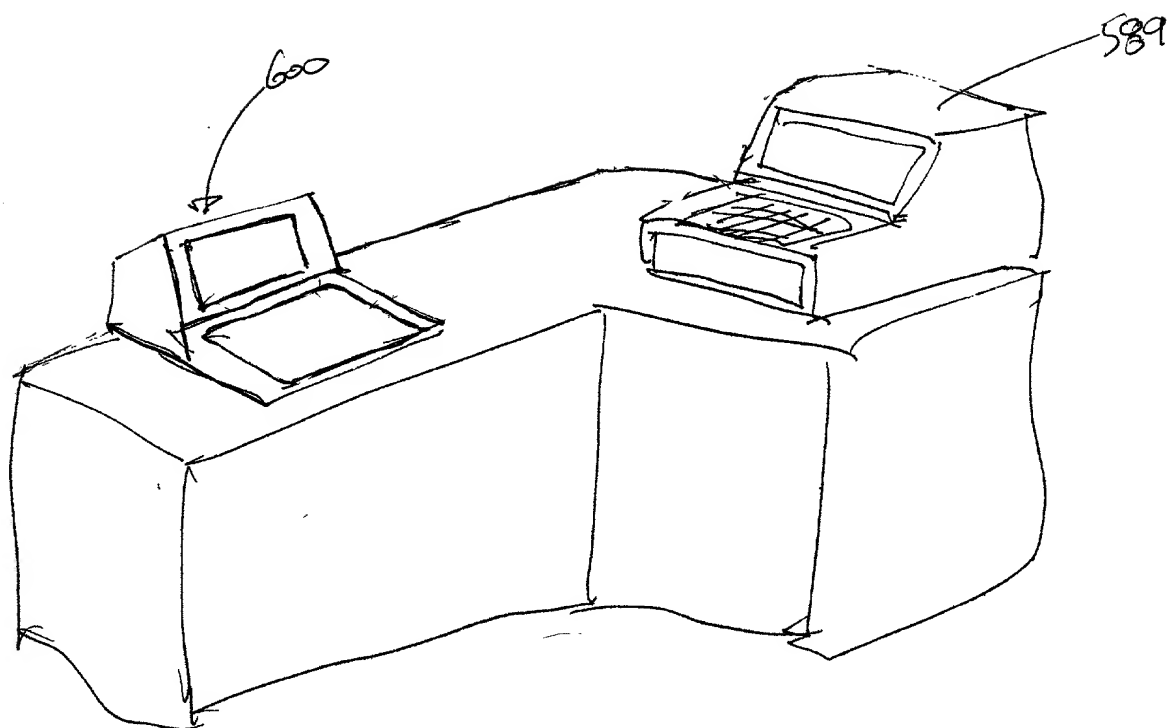


FIG. 34A

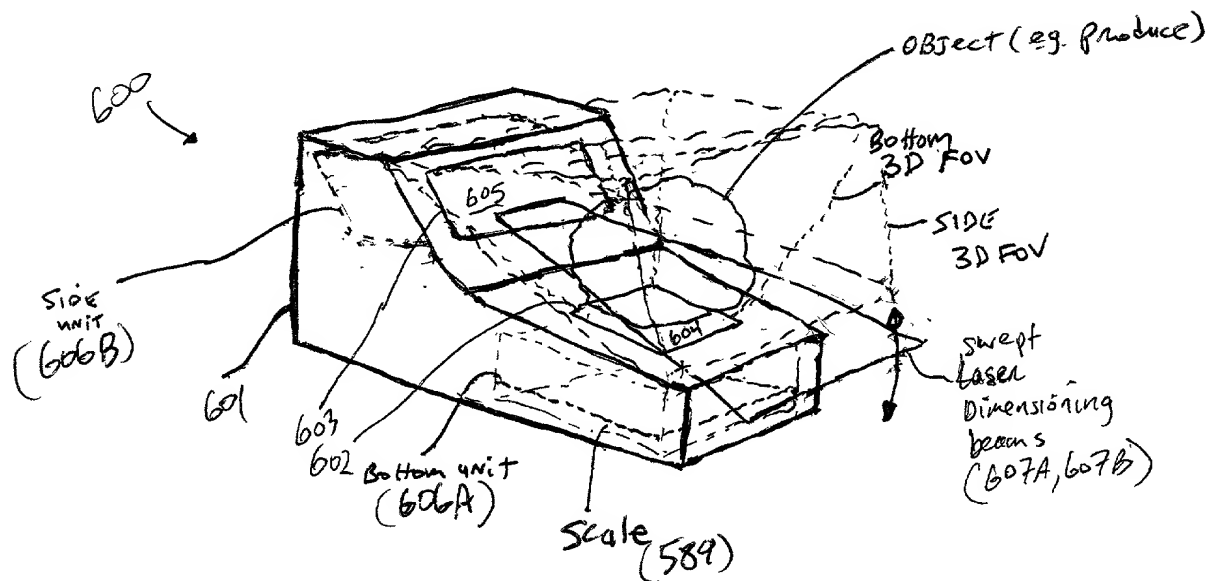
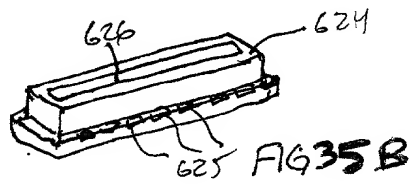
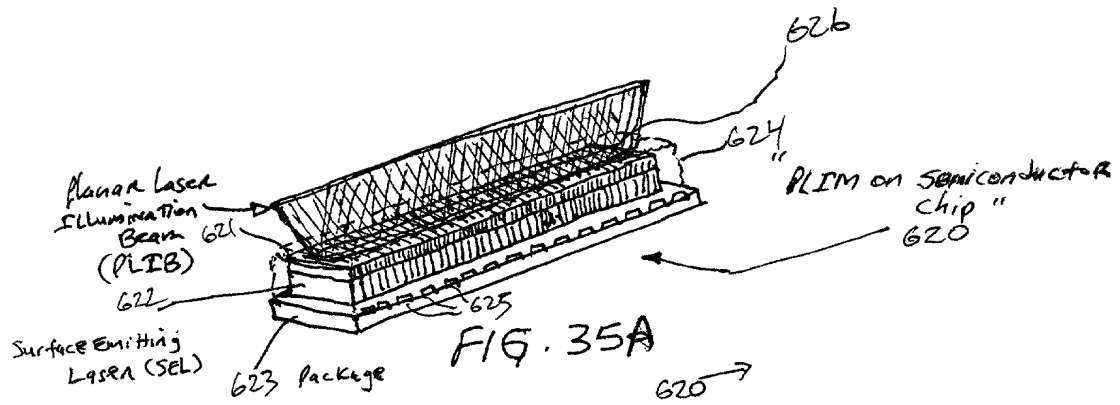


FIG. 34B



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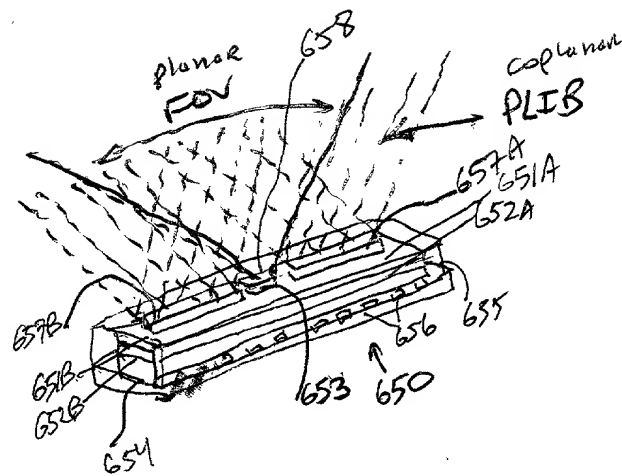


FIG. 37

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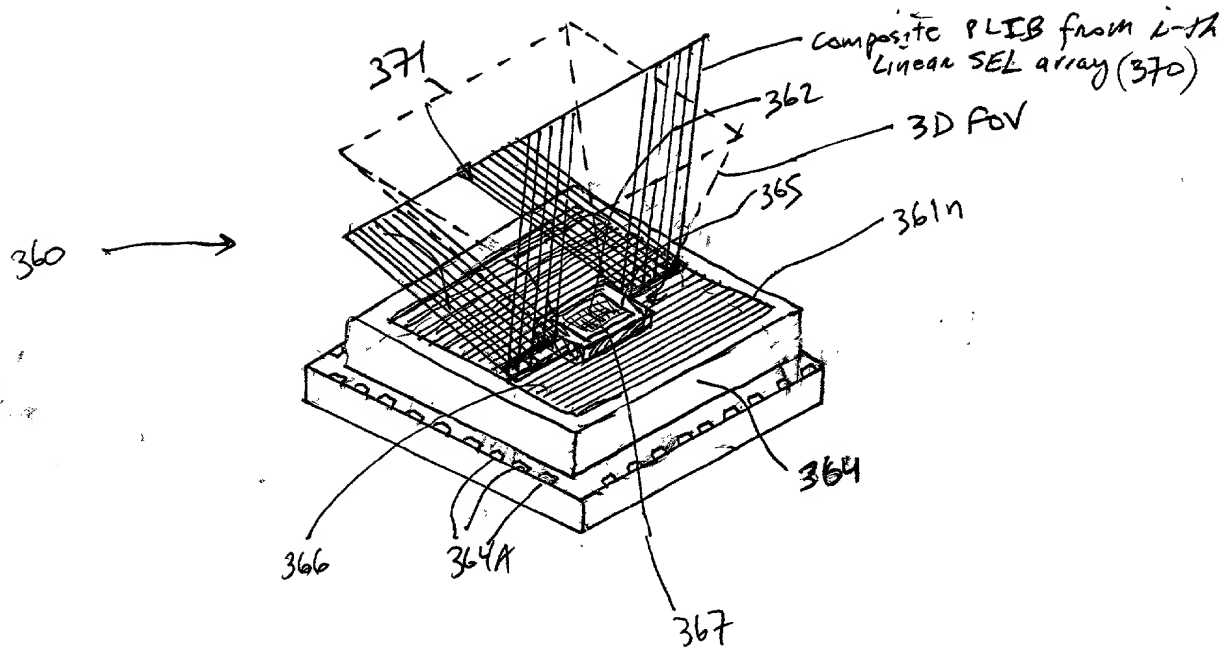


FIG. 38A

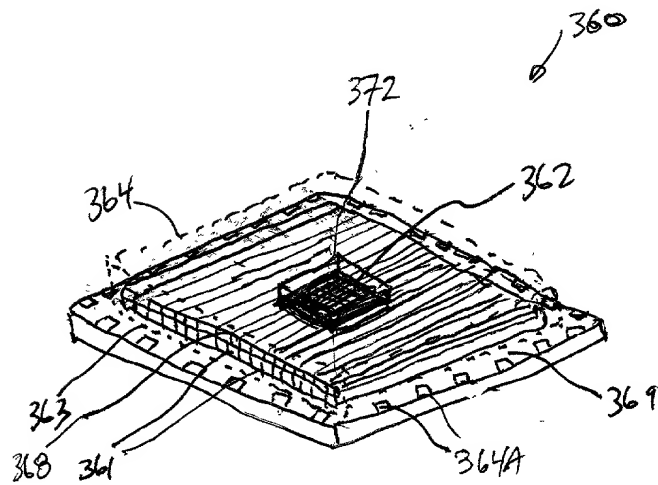


FIG. 38B